SIEMENS

GENERAL ELECTRIC
INSTRUMENTATION SERVICE
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I.D.

LEVEL OSCILLATOR

W 231/D354

200 Hz to 1620 kHz with Frequency lock-in

Instructions for Operation
S45034-W231-B302-51-7618

Electronic Services - Los Angeles
M14959X

SIEMENS AKTIENGESELLSCHAFT

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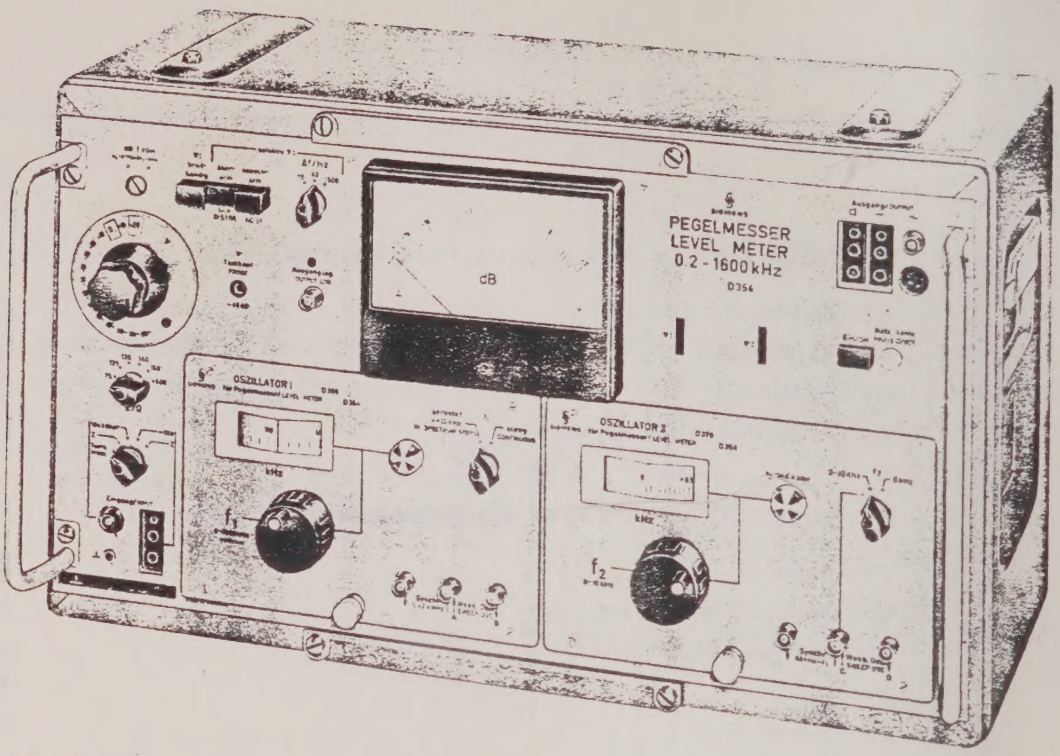
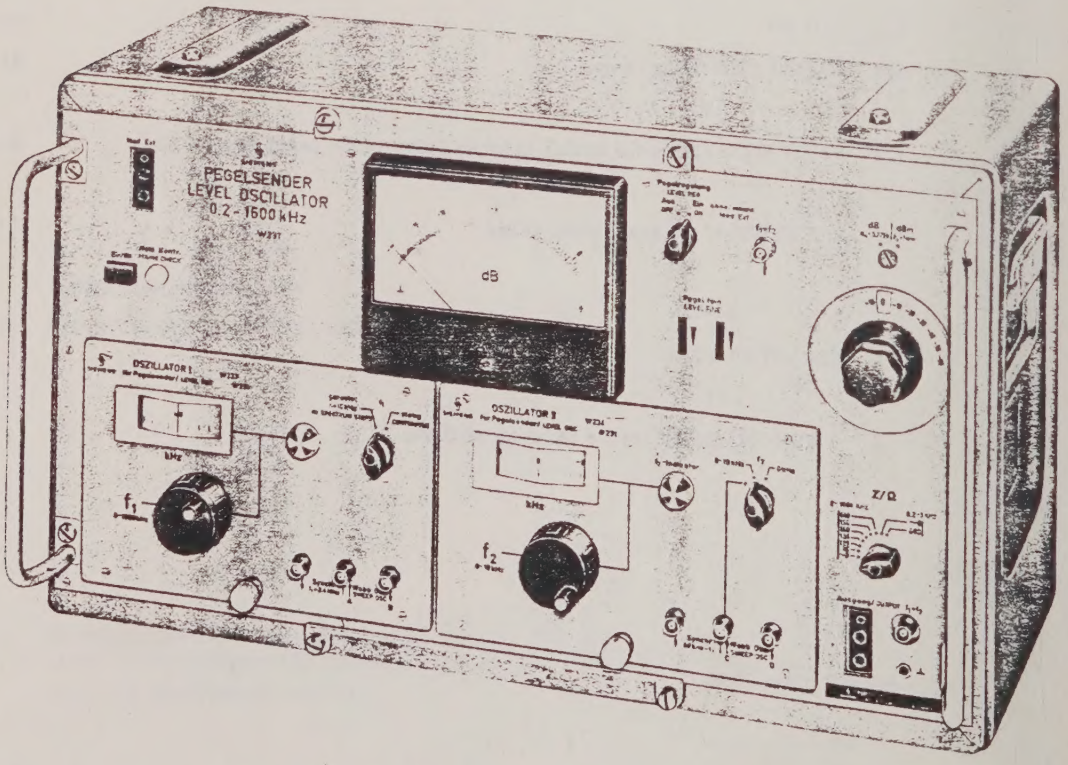


Level meter Type D 354 with the slide-in chassis Oscillator I Type D 369 and Oscillator II Type D 370



Level oscillator Type W 231 with the slide-in chassis Oscillator I Type W 233 and Oscillator II Type W 234

1. DESCRIPTION

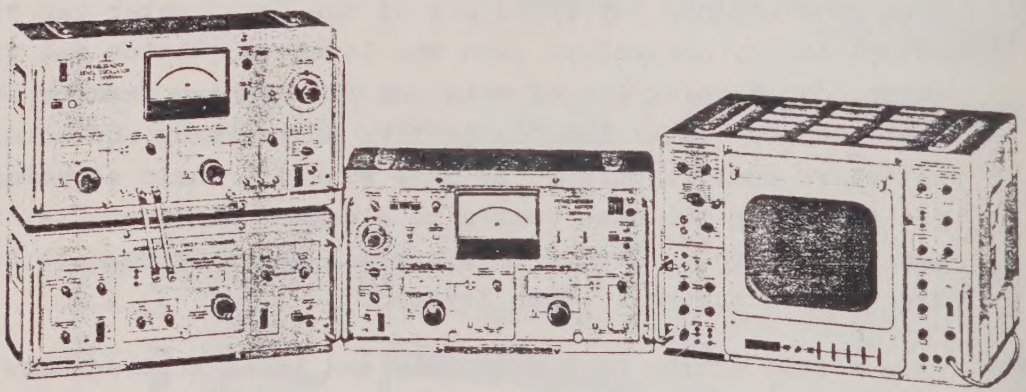
1.1 Application

Level meter and level oscillator, both fitted exclusively with silicon transistors, are constructed and coordinated in such a way as to produce complete measuring setups having particularly high level and frequency accuracy.

Level meter and level oscillator form a measuring setup for wideband level, attenuation and gain measurements in the audio and carrier frequency ranges from 200 Hz to 1620 kHz. Measurements can be made on a wideband or selective basis. With selective measurements the frequency of the level meter can be automatically controlled from the level oscillator and vice versa. Synchronization of main and fine tuning renders tuning operation on one of the two devices unnecessary and permits selective measurements to be made with all their advantages, yet retaining the ease common to wideband measurements. Frequency lock-in derived from a crystal spectrum results in high frequency accuracy of both devices.

As a result of its high frequency and level accuracy the measuring setup is particularly suited to development and testing of devices and systems in communications and electronics. Further, the measuring setup can be used when equipment is being lined up and, when it is a question of great accuracy, also in operational measurements. Its frequency range includes the CCITT groups and supergroups up to 1548 kHz and also all carrier systems and devices having up to 300 voice channels. Even in systems having a large number of voice channels (e.g. V 960, V 2700) many measurement problems fall within the range of the measuring setup. In the same way it covers the frequency range of modulation facilities of radio relay systems which are provided for the transmission of the basebands mentioned above and that of the corresponding balanced and coaxial carrier cables.

The measuring setup can be extended quite simply to form a sweep-frequency measuring setup. The internal oscillators are replaced by external ones which operate in the same frequency range. Their frequency is electronically swept. The sweep range is continually adjustable between ± 25 Hz and ±800 kHz. The oscillator units of the level oscillator continue to operate, providing the frequency markers necessary for the sweep operation, the accuracy of which corresponds to that of the level oscillator. The equipment necessary to sweep the measuring voltage is housed in the sweep-frequency attachment Type W 935, or G 2022 resp., which can be adapted by means of slide-in chassis for large and small sweep ranges depending upon the measuring problem in hand.



Sweep frequency measuring setup 200 Hz to 1.6 MHz
Left: Level oscillator, below: Sweep attachment, middle: Level meter, right: Level tracer

The level tracer Type D 346 displaying on the large screen a continuous trace representing some measured quantity as a function of frequency is connected to the specimen either directly or via the level meter. By adding to the display level and frequency lines, a coordinate system is traced out which is entirely free of tube distortion and parallax. This ensures a very accurate and reliable evaluation of the measured curve. When the level expansion is activated the sensitivity can be so increased that a change in level of 0.1 dB produces a deflection of 15 mm on the screen. Thus also sweep measurements in terms of tenths of a percent are easily possible.

If, on the other hand, level differences of up to 100 dB are to be represented on the screen, the level tracer will be connected to the dynamic output via the logarithmic amplifier. With the wide variation of the sweep range (±25 Hz to ±800 kHz), the large sweep frequency range (0.015 to 25 Hz and manual setting), and high frequency accuracy ($\frac{\Delta f}{f} < 10^{-5}$) all likely measurement problems can be solved in the frequency range of this sweep measurement setup with great time saving.

1.2 Electrical Data

Level Oscillator

Basic device W 231
with slide-in chassis oscillators I W 233 and II W 234

Frequency range ..... 200 Hz to 1620 kHz
set measuring frequency f_m ..... $f_1 + f_2$

Main setting t_1
with spectrum lock-in in 10-kHz steps ....0,...1620 kHz
or continuously ..... 0 to 1620 kHz

Fine setting f_2
with spectrum lock-in ..... 0 Hz
continuously ..... -3 to +13 kHz
smallest frequency increment readable ..... approx.20 Hz

Frequency error
f_1 and f_2 with spectrum lock-in .....$\pm 1 \cdot 10^{-5}$
f_1 with spectrum lock-in, f_2 continuously...$\pm 1 \cdot 10^{-5}$ ±30 Hz

Frequency chang with ±10% mains voltage change
f_1 and f_2 with spectrum lock-in .....$\pm 2 \cdot 10^{-7}$
f_1 with spectrum lock-in, f_2 continuously... $\pm 2 \cdot 10^{-7}$ ±2 Hz

Automatic tuning
frequency tuning of the level meter from the level oscillator for ..... f_1 and f_2
frequency tuning of the level oscillator from the level meter for ..... f_1 and f_2

Automatic frequency sweep

with sweep attachment W 935/G 2022 and slide-in chassis f_1 Type W 940 for wide sweeps....±3 to ±800 kHz

with sweep attachment W 935/G 2022 and slide-in chassis f_2 Type W 941 for narrow sweeps..±25 to ±3000 Hz

mid-frequency, continuously adjustable from ..... 200 Hz to 1620 kHz

	Model B 302: 0 dB≙0.775 V 0 dBm≙1 mV	Model B 602: 0 Np≙0.775V 0 Npm≙1 mV
Level output		
for zero instrument mark, adjustable in steps of 10 dB, 1 Np	-60 to +10 dB -60 to +10 dBm	-6 to +1 Np -6 to +1 Npm
continuous variable about .....15 dB		1.5 Np
smallest adjustable level	-75 dB -75 dBm	-7.5 Np -7.5 Npm
Level output error at 100 kHz and the relative values: range switch 0 dB, 0 Np Instrument mark 0 and Z_i=Z=75Ω.....	±0.1 dB	±0.01 Np
Attenuator error	±0.1 dB	±0.01 Np
Frequency response of the output level	±0.1 dB	±0.01 Np
Level output change with ±10% mains voltage variation	±0.03 dB	±0.003 Np
Typical total level error for Z_i=Z=75Ω, coaxial, outer wire grounded Frequency range 10 kHz to 1 MHz Transmitting level 0 to -50 dB (-5 Np), full-scale deflection with automatic regulation Mains voltage variation ±10% Temperature range +15 °C to +35 °C		±0.2 dB ±0.02 Np

Outputs

three-pole jack .....floating, balanced

coaxial jack 1.6/5.6..... external wire grounded

Internal impedance .....~0 Ω

for frequency range 0.2 to 5 kHz, can be switched to... 600 Ω

for the range 2 to 1620 kHz can be switched to.....75,125,135,140,150,600 Ω

Signal-to-distortion ratio a_{k2} or a_{k3} at 100 kHz and with the relative values 0 Np, 0 dB: Zi=Z=75 Ω .....>54 dB (>6.3 Np)

Spurious emissions .....>60 dB (>7 Np) down

External modulation (AM)..... 0 to 100%

Frequency range .....0 to 20 kHz

Frequency response, as referred to 1 kHz..... ±2%

Envelope distortion ratio for m=100%.....approx.40 dB (approx.4.6 Np)

Required modulation voltage for 1% modulation .....approx. 30 mV

Output voltage for frequency measurements (frequency counter).....1 V

permissible load impedance .....>10 kΩ

Power supply "protective-insulation" grade.....

.....100 to 140 and 200 to 265 V, 47 to 63 Hz, approx. 13 VA at 220 V

LEVEL METER

Basic device D 354

Wideband

Frequency range .....200 Hz to 1620 kHz

	Model	
	B 302: 0 dB≙0.775 mV 0 dBm≙1 mW	B 602: 0 Np≙0.775mV 0 Npm≙1 mW

Measuring ranges

for zero instrument reading can be switched in steps of 10 dB, 1 Np

with balanced input	-40 to +20 dB	-5 to +2 Np
	-30 to +20 dBm	-4 to +2 Npm

smallest measurable (readable) level	-50 (-60) dB -40 (-50) dBm	-6 (-7) Np -5(-6) Npm
with coaxial input	-60 to +20 dB -50 to +20 dBm	-7 to +2 Np -6 to +2 Npm
smallest measurable (readable) level	-70 (-80) dB -60 (-70) dBm	-8 (-9) Np -7 (-8) Npm

Level error at 100 kHz

with the relative values: range switch 0 dB, 0 Np

zero instrument mark	±0.1 dB	±0.01 Np
attenuator error	±0.1 dB	±0.01 Np
Frequency response of the reading	±0.1 dB	±0.01 Np
Variation of the reading with a mains voltage variation of ±10%	±0.03 dB	±0.003 Np

Typical total level error for Z_i=Z=75 Ω, coaxial, outer wire grounded
Frequency range 10 kHz to 1 MHz
Level measuring range 0 to -50 dB (-5 Np) full-scale deflection
Mains voltage variation ±10%
Temperature range +15 °C to +35 °C after calibration

±0.2 dB
±0.02 Np

Impedance of the balanced floating input in the frequency range 1 to 600 kHz .....≧10 kΩ
0.3 to 1000kHz .....≧4 kΩ
0.2 to 1620 kHz.....≧2 kΩ

can be switched to .....75, 125, 135, 140, 150, 600 Ω

Impedance of the coaxial, single-ended input.....10 kΩ ‖ 60 pF
can be switched to .....75, 125, 135, 140, 150, 600 Ω

Dc output
for level scale-spread device or recorder: Z = 2.5 kΩ .....0 to 250 mV

Ac output
frequency range .....as input signal
output level for zero instrument mark: at Z=75Ω .....0 dB (0 Np)
internal impedance ..... 75 Ω

Earphone output .....for audio-frequency modulated input signal

Selective

Basic device D 354
with the slide-in chassis oscillators I
D 369 and II D 370

Frequency range ..... 200 Hz to 1620 kHz

Main setting f_1

with spectrum lock-in in 10 kHz steps.... 0 to 1620 kHz
continuously ..... 0 to 1620 kHz

Fine setting f_2

with spectrum lock-in ..... 0 Hz
continuously .....-3 to +13 kHz
smallest readable frequency increment ..... approx. 20 Hz

Frequency error

f_1 and f_2 with spectrum lock-in ..... $\pm 1 \times 10^{-5}$
f_1 with spectrum lock-in, f_2 continuous ... $\pm 1 \times 10^{-5}$ $\pm$30 Hz

Frequency change with $\pm$10% mains voltage variation

f_1 and f_2 with spectrum lock-in ..... $\pm 2 \times 10^{-7}$
f_1 with spectrum lock-in, f_2 continuously.. $\pm 2 \times 10^{-7}$ $\pm$2 Hz

Automatic tuning system

frequency tuning of the level oscillator
from the level meter for ..... f_1 and f_2
frequency tuning of the level meter from
the level oscillator for ..... f_1 and f_2

Automatic frequency sweep

with sweep attachment W 935/G 2022
and slide-in chassis f_1 W 940
for wide sweeps ..... $\pm$3 to $\pm$800 kHz
with sweep attachment W 935/G 2022
and slide-in chassis f_2 W 940
for narrow sweeps ..... $\pm$25 to $\pm$3000 Hz
mid-frequency, continuously adjustable
from ..... 200 Hz to 1620 kHz

	Model	
	B 302:0 dB≙0.775 V 0 dBm≙1 mW	B 602:0 Np≙0.775V 0 Npm≙1 mW
Measuring ranges		
in the frequency range 2 to 1620 kHz for zero instrument mark, can be switched in steps of 10 dB, 1 Np		
"Low-distortion" measuring function with balanced input	-100 to +20 dB -90 to +20 dBm	-11 to +2Np -10 to +2Npm
smallest (readable) measurable level	-110 (-120)dB -100 (-110)dBm	-12 (-13) Np -11(-12)Npm
with coaxial input	-120 to +0dB -110 to +10dBm	-13 to +0 Np -12 to +1 Npm
smallest measurable (readable) level	-130(-140)dB -120(-130)dBm	-14(-15)Np -13(-14)Npm
"Low-noise" measuring function with balanced input	-60 to +20 dB -50 to +20 dBm	-6 to +2 Np -5 to +2Npm
smallest measurable(readable) level	-70 (-80) dB -60(-70) dBm	-7 (-8) Np -6 (-7) Npm
with coaxial input	-80 to +20 dB -70 to +20 dBm	-8 to +2 Np -7 to +2 Npm
smallest (readable) measurable level	-90(-100) dB -80 (-90) dBm	-9(-10) Np -8(-9) Npm
Measuring ranges		
in the frequency range 200 Hz to 2 kHz "low-noise" measuring function for zero instrument mark can be switched in steps of 10 dB, 1 Np		
with balanced input	-60 to +20 dB* -50 to +20 dBm	-6 to +2 Np* -5 to +2Npm
smallest measurable (readable) level	-70(-80)dB -60(-70) dBm	-7(-8) Np -6(-7) Npm

*In the frequency range >800 Hz measurements can also be made in the more sensitive measuring ranges in the "low-distortion" position.

with coaxial input	-80 to +20 dB*	-8 to +2 Np*
	-70 to +20 dBm	-7 to +2 Npm
smallest measurable (readable) level	-90 (-100) dB	-9 (-10) Np
	-80 (-90) dBm	-8 (-9) Npm

Measuring error at 100 kHz, 0 dB, 0 Np and the relative values: range switch 0 dB, 0 Np zero instrument mark	±0.1 dB	±0.01 Np
attenuator error	±0.1 dB	±0.01 Np
in the most sensitive range ...	±0.3 dB	±0.03 Np
Frequency response of the indication in the frequency range 2 to 1620 kHz	±0.2 dB	±0.02 Np
200 Hz to 2 kHz	±0.4 dB	±0.04 Np
Indication changes with ±10% mains voltage variation	±0.03 dB	±0.003 Np
Typical total measuring error for Z_i=Z=75 Ω, coaxial, outer wire grounded; Frequency range 10 kHz to 1 MHz; Level measuring range 0 to -100 dB (-10 Np) full-scale deflection; Mains voltage variation ±10%; Temperature range +15 °C to +35 °C after calibration		±0.2 dB / ±0.02 Np

Selectivity

can be switched to ..... 3 bandwidths selectivities available

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*In the frequency range > 800 Hz measurements can also be made in the more sensitive measuring ranges in the "low-distortion" position.

	Narrow band Filter 1 (200 Hz to 1620 kHz)	Medium band Filter 2 (2 to 1620 kHz)	Wideband Filter 3 (10 to 1620 kHz)
Width of pass band $\Delta a \leq 0.5$ dB	$\pm$5 Hz	$\pm$20 Hz	$\pm$800 Hz
Bandwidth $\Delta a = 3$ dB	$\sim$20 Hz	$\sim$80 Hz	$\sim$3.1 kHz
Stop-band attenuation			
a = 30 dB at	$\pm$60 Hz	$\pm$150 Hz	$\pm$4 kHz
a = 60 dB at	$\pm$150 Hz	$\pm$500 Hz	$\pm$10 kHz

Intermediate frequencies

f_{IF1} ..... 2.40 MHz

f_{IF2} ..... 100 kHz

Intermediate frequency rejection for f_{IF1}, f_{IF2} .. $\geq$ 80 dB (9 Np)

Image-frequency rejection

for $f_m + 2f_{IF1}$ ..... $\geq$ 60 dB (7 Np)

for $f_m + 2f_{IF2}$ ..... $\geq$ 80 dB (9 Np)

Residual distortion attenuations a_{k2} and a_{k3}

in "low-distortion" position with increase in sensitivity to 60 dB (7 Np)

in the frequency range 2 to 1620 kHz ..... $\geq$ 80 dB (9 Np)

with increase in sensitivity by 50 dB (6 Np)

in the frequency range 500 Hz to 2 kHz ..... $\geq$ 70 dB (8 Np)

200 Hz to 500 Hz..... $\geq$ 60 dB (7 Np)

Impedance of the inputs

as with wideband measurements ..... see page

IF output e.g. for logarithmic amplifier

level output, at Z=600 Ω.....max. 0 dB (0 Np)

output frequency ..... 100 kHz

intensity range for input level.....approx. 100 dB (11 Np)

max. input level at the input..... 0 dB, dBm, Np, Npm

Ac output

frequency	100 kHz
level output for zero instrument mark, at Z=75 Ω	0 dB (0 Np)
internal impedance	75 Ω

Dc output

for level scale-spread device or recorder: at Z=2.5 kΩ	0 to 250 mV

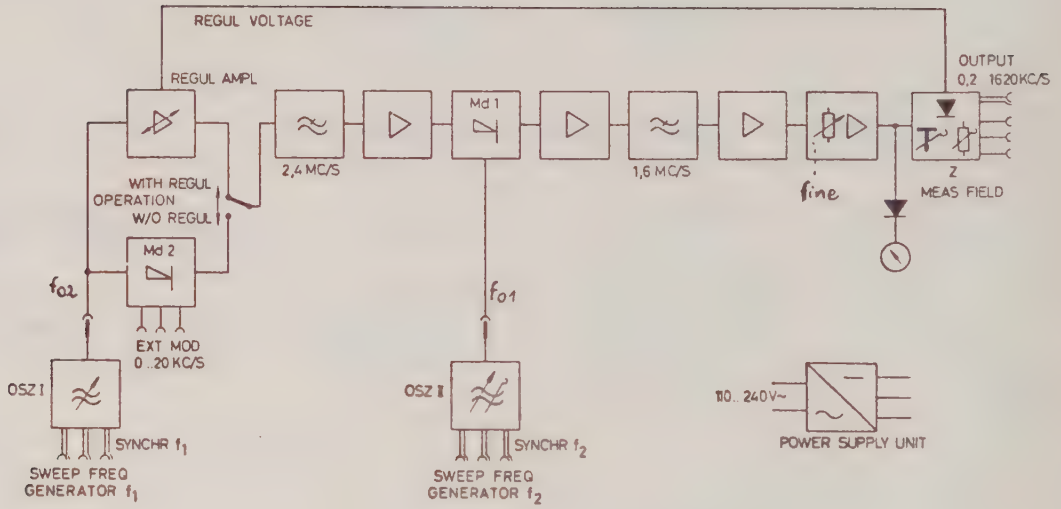
Earphone output .....for audio-frequency modulated input signal

Power supply, "protective-insulation" grade .....100 to 140 and 200 to 265 V, 47 to 63 Hz, approx. 24 VA at 220 V

1.3 Functioning

1.3.1 Level Oscillator

The level oscillator is designed as a beat-frequency oscillator so that the whole frequency range can be covered without band switching. This, along with the unmistakable nature of the scale designations, leads to speedy and continuous measurements. By means of a frequency-spectrum circuit in the variable oscillator I it is possible, if desired, to set the free-running oscillator exactly to a multiple of the fundamental frequency of a crystal oscillator, whereby only a coarse manual setting is necessary, whilst the remaining frequency difference is automatically balanced out by a regulating circuit. In this way it is possible to obtain a crystal-accurate frequency every 10 kHz. Oscillator II provides for interpolating between two spectrum component frequencies: it derives its frequency from the same crystal as oscillator I and in addition from a free-running interpolation oscillator whose frequency, however, is two orders of magnitude lower than that of oscillator II and therefore, as referred to its output frequency, is similarly constant as is the crystal frequency.



level oscillator

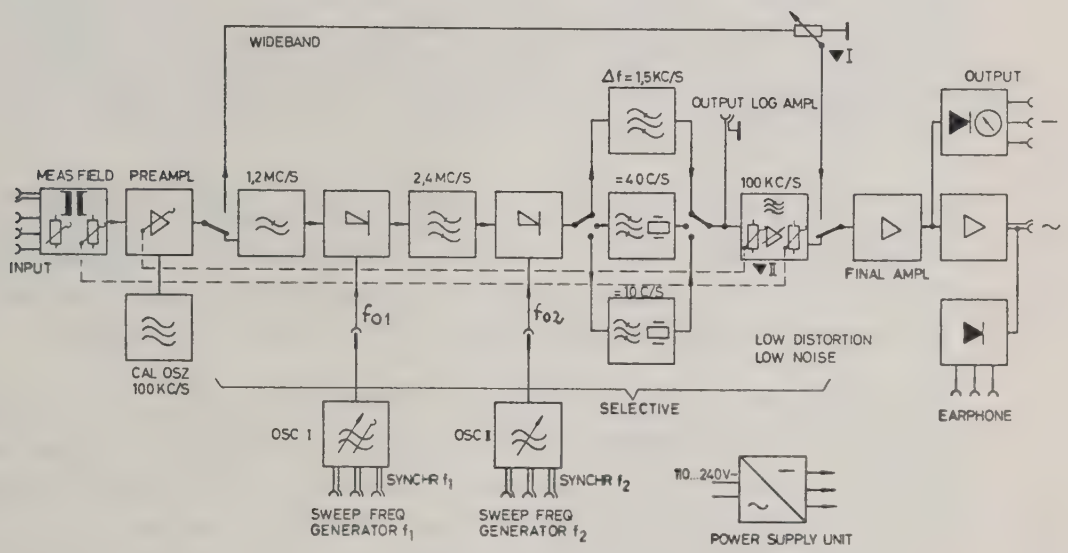
As the variable oscillator frequencies f_{01} and f_{02}' in the level oscillator and level meter are the same, the level meter can be controlled from the transmitting oscillators or the level oscillator from the level-meter oscillators.

A built-in electronic regulating circuit keeps the transmiting level highly constant. The output level can be set between +10 and -75 dB (+1 and -7.5 Np) in 10 dB (1 Np) steps and finely.

The 13 octave wide frequency band is subdivided in the measuring field into an audio range from 0.2 to 5 kHz and a carrier-frequency range from 2 to 1600 kHz. In the audio range the internal impedances ~0 Ω and 600 Ω can be selected; in the carrier-frequency range ~0, 75, 125, 134, 140, 150 and 600 Ω.

1.3.2 Level Meter

The level meter operates according to the superheterodyne principle with double frequency conversion. With selective measurements the frequency range extends from 200 Hz to 1620 kHz. For selective measurements in voice channels from 200 Hz on and pilot level measurements in the total frequency range up to 1620 kHz a particularly narrow filter is provided. Wideband measurements in the range from 200 Hz to 1620 kHz are possible when the heterodyne section is disconnected.



level meter

For wideband measurements the output amplifier follows the preamplifier. The measuring range for zero instrument mark extends from -60 to +20 dB (-7 to +2 Np). The highest sensitivity is given by thermal noise and the bandwidth of the input circuit.

To obtain even higher sensitivity, as is necessary for example in measuring crosstalk and stop-band attenuation of filters, the measuring bandwidth must be reduced. For this purpose a

heterodyne unit with double frequency conversion is interposed between preamplifier and output amplifier for selective measurements. The selectivity is determined by three optionally connectable filters of differing bandwidths.

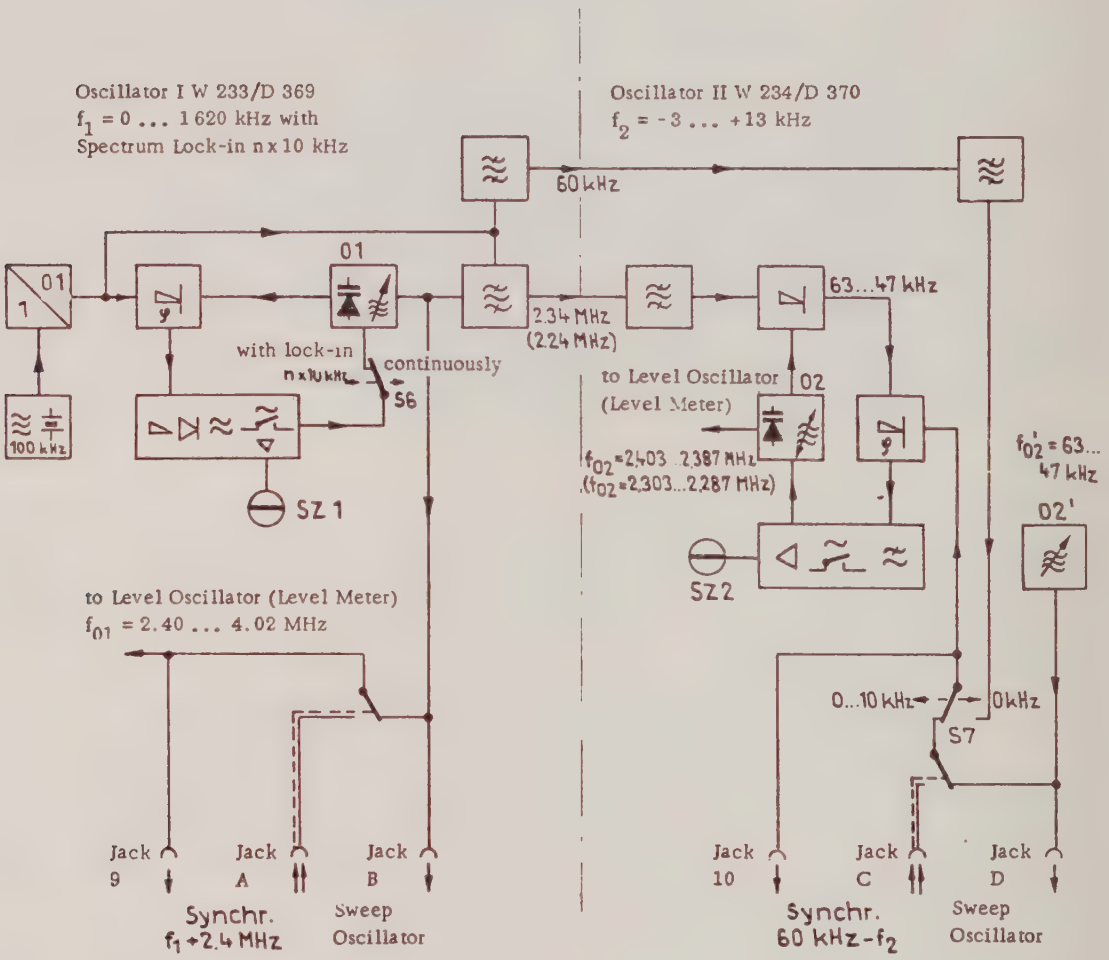
The level meter has a relatively wide filter (1.6 kHz Hz flat, 3.1 kHz between 3 dB points) for surveying and swept measurements, a filter with a bandwidth 40 Hz for point by point measurements and extremely low levels (10 Hz) for pilot level measurements. According to the measurements in hand, the "low--noise" and "low-distortion" operating options are provided to procude the greatest signal-to-noise ratio or the lowest residual distortion. With selective measurements the nominal deflection appears on the instrument when the input level is as low as -120 dB (-13 Np).

High frequency accuracy is achieved by means of a lock-in oscillator I and a finely tunable interpolation oscillator II. The oscillators have a common fundamental crystal and are extremely similar to the ones in the level oscillator.

The level meter has a balanced floating input and a coaxial single-ended grounded input. In addition either a high impedance input or an input terminated into the characteristic impedance of the specimen can be chosen by means of a transfer switch. The terminating impedance itself is adjustable to the usual values between 75 and 600 Ω. The actual input level can be considered by means of the level switch. Further the reading can be switched to voltage level or power level. Attenuation differences which arise with the switching from balanced to coaxial input and from the "low-distortion" to the "low-noise" mode and also with the transfer from voltage level to power level, are automatically taken into account - the actual values being illuminated on the level switch - so that reading errors can be avoided.

In addition to the instrument indication there is a dc output for the connection of a graphic recorder or a scale-spreading device (PEGELLUPE). As a result of the high stability of the level meter measurements in terms of tenths of a percent can so easily be carried out. An ac output produces a level of 0 dB across 75 Ω for zero instrument mark. At the earphone output an audio-frequency modulated input signal can be monitored. Finally there is another output with a particularly high intensity range. Connected with the level tracer Type D 346 and the logarithmic amplifier slide-in chassis Type D 920 of the tracer the attenuation characteristic of a filter, for example, can be represented within a level range of 100 dB.

1.3.3 Oscillators I and II for Level Oscillator and Level Meter



The frequency data given in brackets refer to the oscillators of the level meter

1.3.3.1 Oscillator I (spectrum oscillator) W 233 for the Level Oscillator W 231 and D 369 for the Level Meter D 354

Oscillator I (spectrum oscillator) produces the control voltage for the main modulators in the level oscillator and the level meter. It sweeps the frequency range f_{01} = 2.40 to 4.02 MHz. When operating with spectrum lock-in, switch S6 in

"spectrum lock-in position n x 10 kHz", the output frequency of the oscillator can be set to all values n x 10 kHz with crystal accuracy. For this purpose it contains a 10-kHz crystal spectrum which is derived from a crystal-controlled 100-kHz oscillator. This 10-kHz spectrum is compared with the frequency of the oscillator 01 in a frequency regulating circuit.

A lock-in indicator (Sz 1) shows whether the frequency of 01 lies on or near a spectrum point. After disconnecting the frequency spectrum generator with switch S6, oscillator I can be also operated with continuous frequency control.

1.3.3.2 Oscillator II (Interpolator) W 234 for Level Oscillator W 231 and D 370 for Level Meter D 354

Oscillator II (interpolator) generates the signal voltage (f_{02} = 2.403 to 2.387 MHz) for the main modulator of the level oscillator, and the drive voltage (f_{02} = 2.303 to 2.287 MHz) for the second modulator of the level meter, respectively. It is continuously tunable in a range of 16 kHz so that every frequency between two spectrum points can be "interpolated" with an overlap. The frequency (f_{02}) of oscillator 02 is controlled by the interpolation oscillator 02' ($f_{02'}$ = 63 to 47 kHz). By means of a frequency regulating circuit the resultant frequency is the sum of the frequencies of the interpolation oscillator ($f_{02'}$) and the spectrum frequencies 2.34 MHz (level oscillator) and 2.24 MHz (level meter) respectively.

The interpolation frequency is nearly two orders of magnitude below that of the spectrum frequency used so that its absolute error corresponds approximately to that of the crystal-accurate spectrum frequency. Therefore the voltage produced by oscillator II has approximately the frequency accuracy of a crystal.

If desired, oscillator II can be set with crystal accuracy to the output frequency f_{02} = 2.40 MHz (2.30 MHz). To do so the interpolation oscillator is switched off at switch S7 and the 60-kHz frequency derived from the 10-kHz spectrum used as

control frequency for oscillator 02.

Oscillator II only operates in the "locked" position. This is shown on the main visual indicator, i.e. Sz 2 shows green.

1.3.3.3 Automatic Tuning

With selective operation of the level meter, automatic tuning for f_1 and f_2 permits single-knob frequency tuning. As a result either the level oscillator or level meter can be selected as the controlling device according to the measuring problem in hand.

Automatic Tuning for f_1

For this, jack Bu 9 of the controlling device and jack Bu A of the controlled device must be interconnected. Then oscillator 01 delivers via jack Bu 9 the sync line and jack Bu A the control level for the main modulator of the controlled device. At the same time the spectrum oscillator of the controlled device is disconnected via the jack-operated contact with respect to RF.

Automatic Tuning for f_2

The automatic tuning system for f_2 operates similarly to that for f_1. As the output frequencies of the oscillators 02 in the level oscillator (2.403 to 2.387 MHz) and level meter (2.303 to 2.287 MHz) differ by 100 kHz, the second intermediate frequency of the level meter, synchronization is here effected in the frequency position of the oscillator 02' ($f_{02'}$ = 63 to 47 kHz).

When the jack Bu 10 of the controlling device is connected to the jack Bu C of the controlled device the oscillator 02' is switched off.

The level received by jack Bu C now controls the frequency regulating circuit. The output frequency f_{02} of the controlled oscillator II is now offset by exactly 100 kHz from that of the controlling oscillator II.

1.3.3.4 Sweeping

By means of an electronic sweep device it is possible to sweep the level measuring setup within ±25 Hz to ±800 kHz. In this operation the measuring frequency changes in the form of a triangular function. The frequency sweep range, the mid-frequency and the sweep rate can be set according to the measuring problem in hand. The sweep equipment consists of a sweep attachment W 935/G 2022 ans various sweep oscillator slide-in chassis for adaptation to various level measuring setups. Two slide-in chassis are provided for the 1.6-MHz level measuring setup W 231/D 354:

sweep oscillator I W 940 for sweeping the oscillators I W 233/D 369 within a range of

± 3 to ±800 kHz and

sweep oscillator II W 941 for sweeping the oscillators II W 234/D 370 within a range of

± 25 Hz to ± 3 kHz.

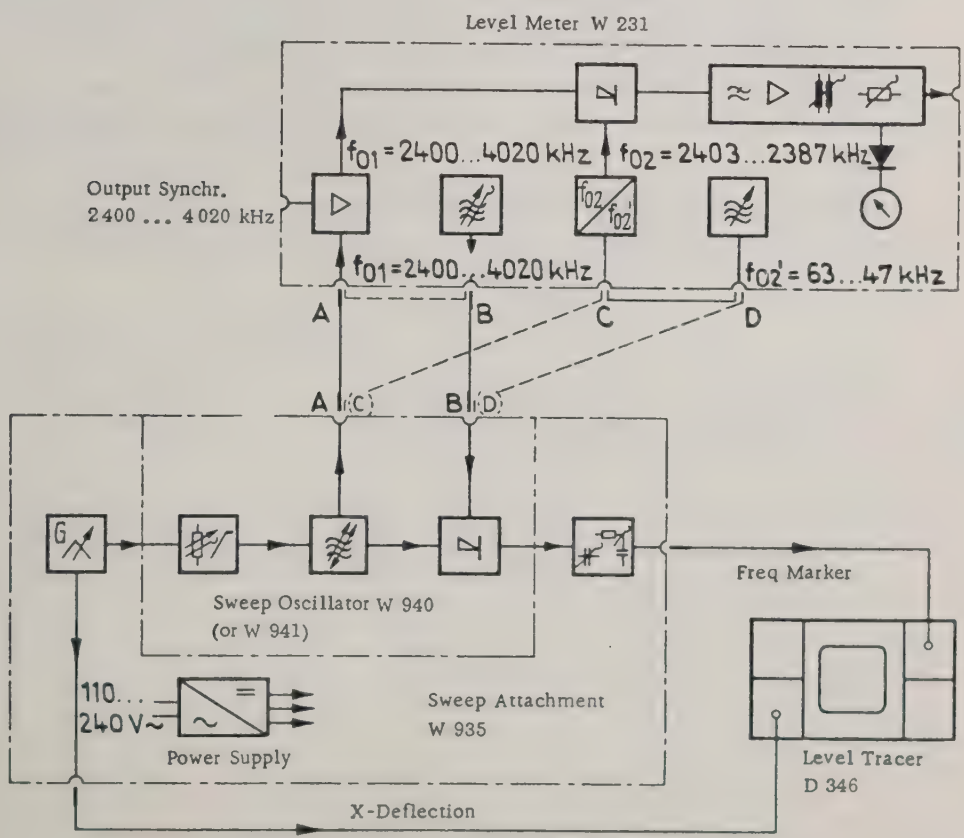


Fig. 3 Carrier-Frequency Sweep Measuring Setup
Functional Circuit Diagram

Fig. 3 shows the sweeping of the level oscillator. For wide sweeps of ±3 to ±800 kHz the sweep oscillator I W 940 delivers its output voltage at the jack Bu A of the level oscillator and thereby controls the main modulator of the oscillator. For RF, the level-oscillator spectrum-oscillator is separated from its basic device by the switching contact at jack Bu A, but still delivers its RF voltage via the jack Bu B into the sweep oscillator to produce a frequency marker for the level tracer.

For small sweeps of ±25 Hz to ±3 kHz the sweep functions in a similar way as for wide sweeps. The sweep attachment now contains the sweep oscillator W 941 which is connected to the level oscillator via the sockets Bu C and Bu D.

The frequencies and levels at the sweep terminals A,B,C and D of oscillators I and II of the level oscillator and level meter correspond. Therefore the level meter can be swept with the same sweep oscillators. A level meter extended in this way is said to be a panoramic receiver which, on the level tracer, shows the actual signal coverage on the swept frequency range.

Further information on the operation of the sweep measuring setup is contained in the description M 706.

1.4 Accessories, Dimensions and Weights

Description	Type	Dimensions in mm	Approx. Weight in kg
Level oscillator W 231 200 Hz to 1620 kHz			
-75 to +10 dB/dBm	S45034-W231-B302	556x326x307	14.3
-7.5 to +1 Np/Npm	S45034-W231-B602	556x326x307	14.3
Accessories:			
2 coaxial connection cords	V42251-C113-A102	1000	0.3
Necessary for operation:			
Oscillator I W 233 0 to 1620 kHz	S45034-W233-A702	-	3
Oscillator II W 234 -3 to +13 kHz	S45034-W234-A702	-	3
Level meter D 354 200 Hz to 1620 kHz			
-130 to +20 dB/dBm	S45034-D354-B302	556x326x307	16
-14 to +2 Np/Npm	S45034-D354-B602	556x326x307	16
Necessary for operation:			
Oscillator I D 369 0 to 1620 kHz	S45034-D369-A702	-	3
Oscillator II D 370 -3 to +13 kHz	S45034-D370-A702	-	3
Accessories on request			
Connecting cords,			
balanced	Rel ltg 546a to d	500 to 2000	0.2
balanced	Rel ltg 703d to h	1000 to 3000	0.2
coaxial 1.6/5,6; Z=75Ω	V42251-C100-A117	1000	0.3
Sweep attachment W 935,or G 2022 resp.	see data bulletin M 706	556x258x307	10
Level tracer D 346	see data bulletin M 706	556x394x517	35

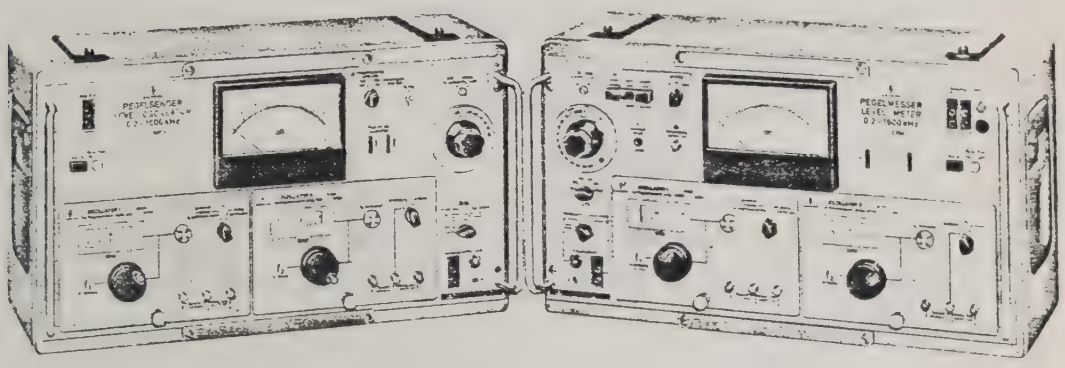


Fig.1 Level oscillator W 231 with oscillators W 233 and W 234

Level meter D 354 with oscillators D 369 and D 370

2.1 Preparation

The devices leave the factory for connection to a supply voltage of 200 V ac to 265 V ac, shown at the voltage selector S8 by "200 V". For other supply voltages between 100 V ac and 140 V ac the voltage adjuster S8, contained in the power supply jack, must be set in position "110 V".

If the device is to be used on 110 V, the 0.315-A fuse in the power supply assembly of the level meter should be changed for a 0.63-A fuse. This fuse is in the spares bag fastened to the chassis.

The power socket is on the back panel of the device. The connection to the mains is made via the power cord supplied.

The devices are, in accordance with the protective grounding safety regulations of the VDE (Association of German Electrical Engineers), insulated against excessive touch potentials.

2.2 Assembling the Measuring Setup

The measuring setup is preferably assembled as in Fig. 1.

2.3 Calibrating and Setting

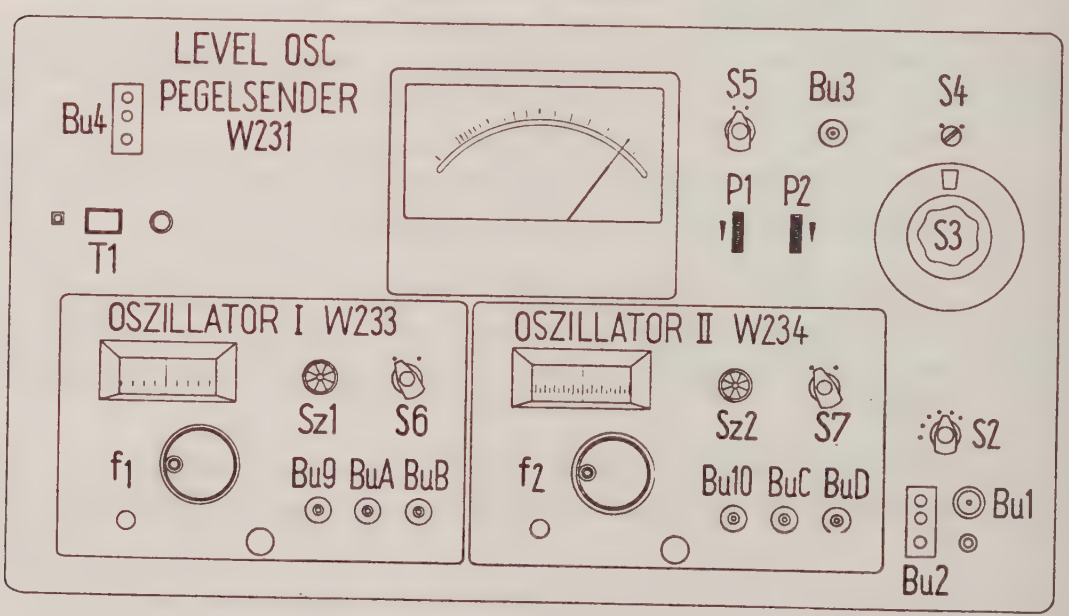
2.3.1 Level Oscillator

Connect the level oscillator to the ac mains and energize it with the power switch T1. The indicating lamp SL1 near T1 lights up for a check. The device is ready for operation immediately.

2.3.1.1 Setting the Frequency

The transmitting frequency is the sum of the settings of f_1 and f_2 of oscillators I and II.

At switch S6 of oscillator I the choice is made between "tuning, locked in spectrum steps n x 10 kHz" (when high frequency stability and accuracy are required) and continuous (for general measurements). At switch S7 of oscillator II the choice is made between continuous control "0 to 10 kHz" and the crystal-accurate spectrum lock-in point "0 kHz".



Then the following adjustments are possible:

S6: with spectrum lock-in n x 10 kHz, S7: 0 to 10 kHz

f_1-adjustment to the spectrum lock-in point directly below the transmitting frequency and then adjust f_2 for the total locking amount.

S6: with spectrum lock-in n x 10 kHz, S7: 0 kHz
gives crystal-accurate transmitting frequencies n x 10 kHz in the range 10 to 1620 kHz.

S6: continuous, S7: 0 kHz
With f_1 any frequency in the range 0.2 to 1620 kHz can be set. The variety of settings possible is important for general measurements, i.e. to find the pass band or attenuation poles of unknown specimens. For exact measurements proceed subsequently according to 1.1.

S6: continuous, S7: 0 to 10 kHz
Possible settings as in 1.3 but additional fine setting with f_2 is possible.

Visual indicators Sz1 and Sz2 show the operation condition of the oscillators as follows:

Oscillator I		Oscillator II*	
Setting f_1	Sz1	Setting f_2	Sz2
with spectrum lock-in n x 10 kHz on a spectrum point	green	0 to 10 kHz	green
with spectrum lock-in n x 10 kHz between two spectrum points	red	0 kHz (crystal accurate)	green
continuous	green		

*Note: When the devices are turned on or S7 transfers Sz2 attracts for approx. 0.4 s, i.e. shows red.

2.3.1.2 Setting the Internal Impedance

The internal impedance of the level oscillator is set to the Z-value of the specimen by the Z-switch S2. When doing this take note of the range limits of the audio (0.2 to 5 kHz) and carrier-frequency (2 to 1600 kHz) measuring fields.

For various measuring connections, a low-impedance source is advantageous: setting Z ~0 Ω. Take note that setting Z ~ 0 Ω in the carrier-frequency range is loaded with Z ≧ 75 Ω and in the audio range with Z ≧ 600 Ω.

2.3.1.3 Voltage or Power Level

The calibration of the level oscillator can be switched from voltage level (0 dB/Np corresp. to V_o = 0.775 V) to power level (0 dBm/Npm corresp. to P_o = 1 mW/across Z) by means of Switch S4.

2.3.1.4 Setting the Transmitting Level

With S3 the transmitting level can be set in 10-dB (1-Np) steps and with the fine control P1 the intermediate values can be set by reference to the instrument. In the automatic level control mode (S5: ON), "Level Fine" control P2 affords an additional control of the output level over a vernier range of approx. ±0.5 dB/±0.05 Np.

2.3.1.5 Level Regulation

The built-in level control can be disconnected at switch S5: necessary for measurements with amplitude modulation. For all other measurements set S5 on "On".

2.3.1.6 Modulation

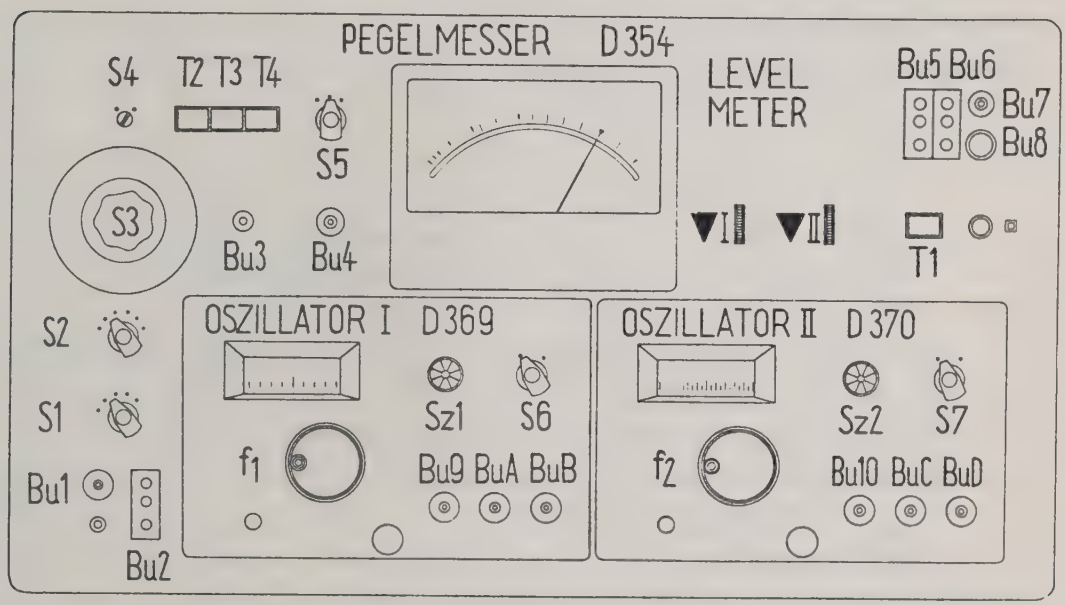
By applying an ac voltage having a frequency of up to 20 kHz to jack 4 the output signal can be amplitude modulated. For this S5 should be in position "Off". A modulating voltage of approximately 3 V rms is required for 100% modulation. The input impedance of the external modulation device is about 5 kΩ.

2.3.1.7 Connection of a Frequency Counter

Jack 3 is provided for the connection of a frequency counter. With a load of ≧ 10 kΩ and zero instrument indication there is an output voltage of approx. 1 V rms at jack 3.

2.3.1.8 Expansion to the Sweep Measuring Setup

For the required details refer to the Full Information on the attachments.



2.3.2 Level Meter

Connect the level meter to the ac mains and energize it with the power button T1. For verification the indicating lamp SL1 near T1 lights up. The device is immediately ready for operation.

2.3.2.1 Level Calibration

The settings for wideband and selective calibration are independent of each other, without any interaction. Before calibration the mechanical zero of the instrument ($-\infty$ on the scale) should be checked with the device energized.

Calibration "▼I" for Wideband Measurements

S3: left stop in position "▼"

T2: depressed

Then adjust the instrument pointer with the knurled knob "▼I" (near the instrument) to the red calibrating mark.

Calibration "▼II" for Selective Measurements

During the calibrating procedure no plugs must be in the jacks A and C.

S3: left stop in position "▼"
S5: choose desired pass band width, see 2.3.2.4.
S6: with spectrum lock-in n x 10 kHz
f_1: with spectrum lock-in 100 kHz
S7: "▼II, 0 to 10 kHz"
T3 or T4: depress

With the frequency control f_2 maximize the meter reading (calibration 100 kHz), then adjust the knurled knob "▼II" for deflection to the red calibrating mark.

2.3.2.2 Input Impedance of the Level Meter and Termination of the Specimen

By means of switches S1 and S2 the input impedance of the level meter can be selected and matched to the Z-value of the specimen. With S1 either the coaxial input jack 1 or the balanced input jack 2 is selected. In the positions "Z" of S1 the inputs are terminated into the values set at the Z-switch S2. In a further position of the switch S1 the input impedance of the level meter is 10 kΩ ‖ 60 pF with coaxial input and > 10 kΩ with balanced input (see electrical values, page 5).

These positions are used for measurements on specimens or systems which are already terminated into their characteristic impedances.

2.3.2.3 Voltage or Power Level

The calibration of the level meter can be switched from voltage level (0 dB/Np corresp. to V_o = 0.775 V) to power level (0 dBm/Npm corresp. to P_o = 1 mW/across Z) by means of switch S4.

2.3.2.4 Choice of Pass Band Width

For adaptation to various measuring problems three band widths can be selected by means of switch S5.

Bandwidth 1600 Hz (3-dB-down bandwidth ~ 3.1 kHz) for general and sweep measurements in the frequency range 10 to 1620 kHz;

Bandwidth 40 Hz (3-dB-down bandwidth ~ 80 Hz) for exact measurements and for suppression of interfering voltages when utilizing full sensitivity with sweeping in the frequency range 2 to 1620 kHz;

Bandwidth 10 Hz (3-dB-down bandwidth 20 Hz) for separating frequencies lying very close together, e.g. pilot level measurements and for measurements in the VF channels.

Frequency range 200 Hz to 1620 kHz.

2.3.2.5 Signal-to-Noise Ratio (T3: low-distortion, T4: low-noise)

Special applications, such as the presentation of curves on the screen of a level tracer or the increasing of the relative measuring accuracy by means of a scale-spread attachment B 977 require a signal-to-noise ratio as large as possible. It is at its largest when key T4 "low-noise" is depressed. This position should be used for all customary measurements. Depress key T3 "low-distortion" only when the sensitivity is to be further increased (a lamp no longer lights up in the "Koramat" unit) or when measuring distortion. In the low distortion mode, a pass band width of 40 Hz, or for the audio range 10 Hz, should be selected.

2.4 Measuring

2.4.1 Wideband Level Measurements

Level oscillator: set as in 2.3

Level meter: after setting the switches S1 and S2 to the required input impedance and the line system (coaxial or balanced) and S4 to the calibration for voltage level (dB,Np) and power level (dBm,Npm), respectively, connect the specimen to the input via a shielded line. Depress T2 "wideband". Set

the range switch S3 to a range in which the pointer of the instrument is well up-scale, if possible. The unknown level is found by adding the value shown in the illuminated window of the level range switch ("Koramat") and the instrument reading. If no lamp of the level range switch lights up any longer, the measuring range for wideband measurements has been exceeded.

2.4.2 Selective Measurements (without automatic tuning)

Level oscillator: setting as in 2.3.

Level meter: settings S1, S2, S3, and S4 as for wideband measurements. Depress key T4 or T3, respectively, when maximum sensitivity is required (see 2.3.2.5).

First set S6 to continuous, S7 to 0 kHz and S5 to bandwidth 1600 Hz (note 2.3.2.4). Slowly turn f_1 through the related frequency range until a deflection appears. Tune frequency for maximum deflection. Set sensitivity with S3 so that the pointer of the instrument is well up-scale.

Level reading as with wideband measurements:

Sum of the values shown on the range switch and the instrument. If the measuring frequency is to be accurately determined set S6 to "with spectrum lock-in n x 10 kHz", S7 to "0 to 10 kHz" and S5 to 40 Hz or 10 Hz. Set the f_1 tuning control to the spectrum point lying directly under the measuring frequency so that Sz1 shows green. Then tune f_2 for maximum instrument indication. The frequency of the unknown voltage then equals the sum of the settings $f_1 + f_2$.

2.4.3 Distortion Attenuation Measurements

In the "selective" range the level meter is also suited for measuring low distortion factors down to 0.1‰ (60 dB or 7 Np distortion attenuation). If the sensitivity is increased by 60 dB (7 Np) the residual distortion attenuation of the level meter is $\geq$ 80 dB (9 Np) and is independent of the fundamental level at the preamplifier and main modulator. Depress key T3

"low-distortion" for measuring distortion attenuation. Select pass band width 40 Hz or, for frequencies below 2 kHz, 10 Hz. For determining the distortion attenuation the fundamental level (f_m) must first be measured. Then the instrument is tuned to the respective harmonics $2 \times f_m$, $3 \times f_m$ etc. with a corresponding increase in sensitivity by means of switch S3. The difference, in logarithmic measure, between the fundamental level and the harmonic level is the distortion attenuation a_{kn} for the respective (n-th) harmonic.

When measuring the harmonic level it should be noted that the sensitivity must not be increased by more than 60 dB (7 Np) with S3 as compared with the setting for measuring the fundamental level. As long as an increase of the sensitivity with S3 brings about a correspondingly greater deflection on the instrument it is certain that the harmonic shown is really due to the measuring voltage and the instrument is operating in its linear range.

From the distortion attenuation a_{kn} the distortion factor k_n for the n-th harmonic can be calculated as a percentage as follows:

$$k_n = 100 \times 10^{\frac{-a_{kn}}{20}} \qquad \text{in \% for } a_k \text{ in decibel}$$

$$k_n = 10 - e^{-a_{kn}} \qquad \text{in \% for } a_k \text{ in neper}$$

For distortion attenuations of $a_{kn} > 20$ dB the distortion factor of the measuring level is calculated as follows:

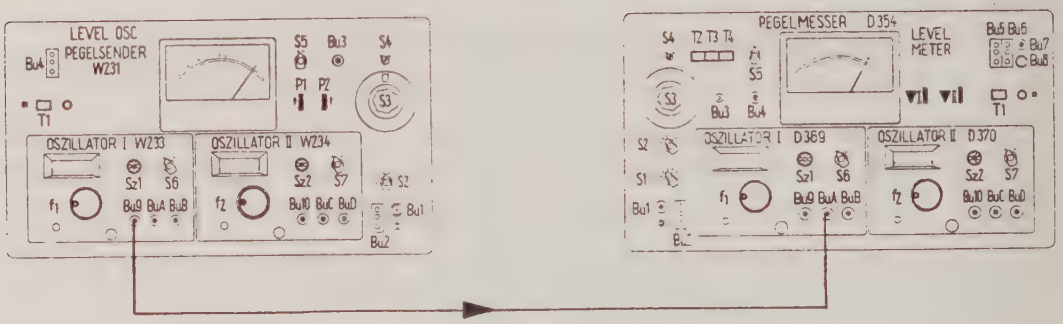
$$k = \sqrt{k_2^2 + k_3^2 + \ldots k_n^2} \qquad \text{in \%}$$

2.4.4 Measurements with Automatic Tuning

Select the bandwidth with S5 according to the measurement problem. If difficulties should arise with the 10-Hz filter in circuit, note point 3.4 in the Maintenance Instructions.

Setting the Frequency on the Level Oscillator

Automatic Tuning for f_1

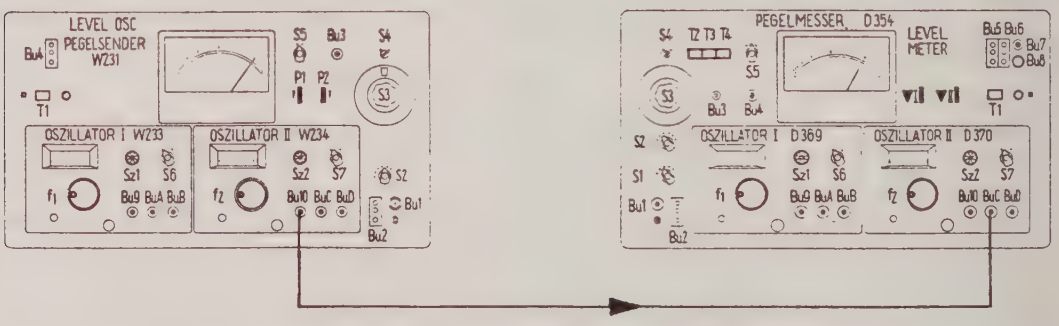


Before beginning measurements set the pointer to a maximum with f_2.

For f_2 = 0 kHz set S7 at the level oscillator and level meter to 0 kHz.

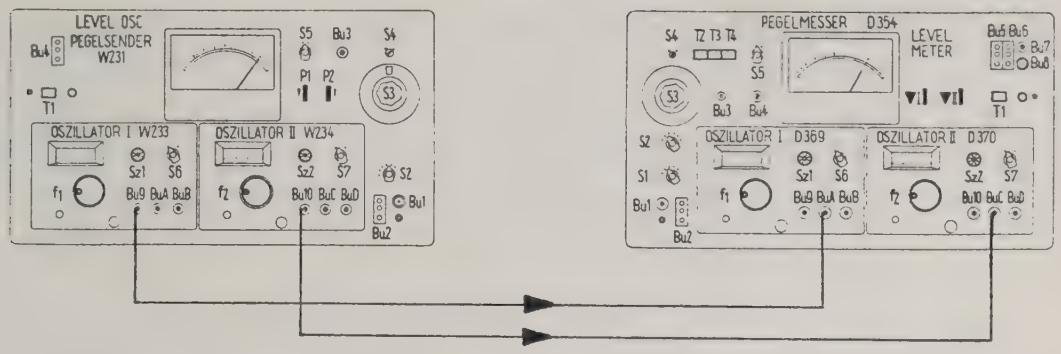
Set the frequency at the level oscillator with f_1 only.

Automatic Tuning for f_2



For quadripole measurements set f_1 at the level oscillator and level meter to the same frequency and thereby switch S6 to "with spectrum lock-in n x 10 kHz". Set switch S7 at oscillator II of the level meter to position "0 to 10 kHz".

Automatic Tuning for f_1 and f_2



Settings at the level oscillator:

Frequency settings f_1 and f_2

S6: either "with spectrum lock-in n x 10 kHz" or "continuous"

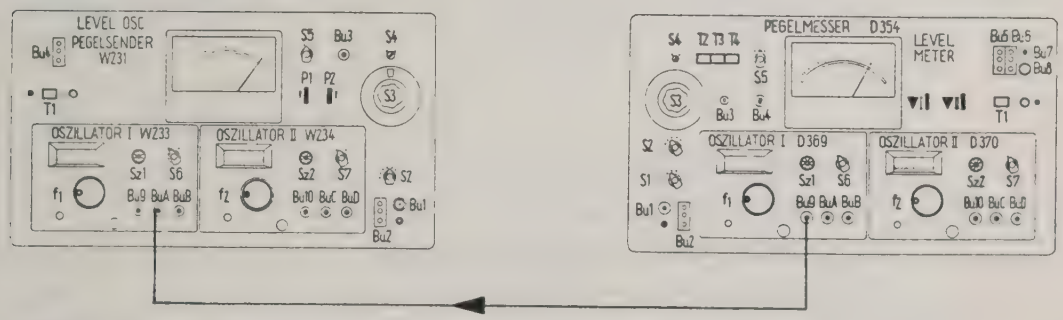
S7: either "0 to 10 kHz" or "0 kHz"

Settings at the level meter:

S7: "0 to 10 kHz"

Frequency Settings at the Level Meter

Automatic Tuning for f_1

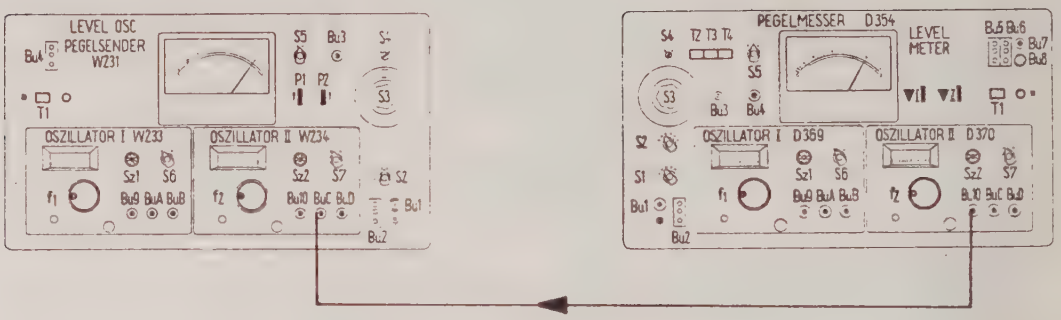


Before beginning measurements adjust f_2 for maximum pointer deflection.

For f_2 = 0 kHz set S7 at the level oscillator and level meter to "0 kHz".

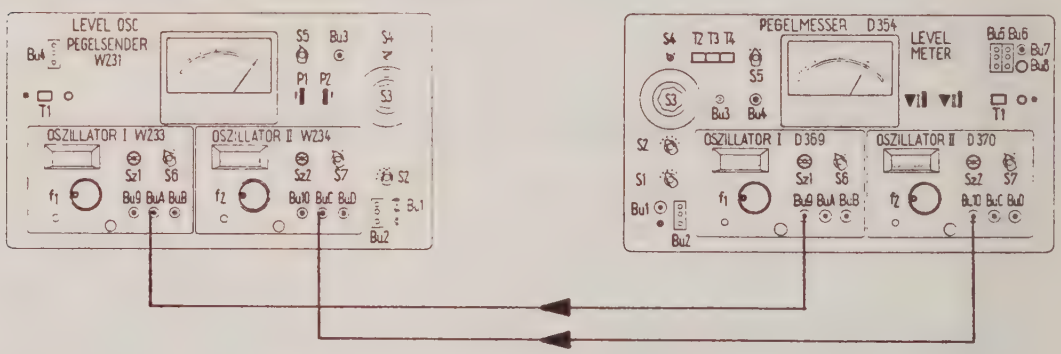
Set the frequency at the level meter with f_1 only.

Automatic Tuning for f_2



For quadripole measurements set f_1 at the level oscillator and level meter to the same frequency and thereby switch S6 to "with spectrum lock-in n x 10 kHz". Set switch S7 at oscillator II of the level oscillator to position "0 to 10 kHz".

Automatic Tuning for f_1 and f_2



Settings at the level meter:

Frequency settings f_1 and f_2

S6: either "with spectrum lock-in n x 10 kHz" or "continuous"

S7: either "0 to 10 kHz" or "0 kHz"

Settings at the level oscillator:

S7: "0 to 10 kHz"

2.4.5 Automatic Tuning with Other Carrier-frequency Measuring Devices in the Frequency Range up to 1.6 MHz

Automatic Tuning from the Digital Level Oscillator G 2001/G2004

The digital level oscillators G 2001 and G 2004 produce a synchronizing voltage at the jack "Bu 1 f_1 + 2.4 MHz" with which oscillators I of the level oscillator or level meter can be controlled. Oscillators II must be set to "0 kHz" by means of switch S7.

Automatic Tuning in the Case of the 1.6-MHz Measuring Setup W 221/D 344

The tuning condition for f_1 of the level oscillator W 221 or level meter D 344 can be controlled by oscillator I of the level oscillator or level meter (jack 9). In level oscillator W 221 jack Bu A is the input jack for the sync voltage, in the level meter the jack "Sync.f_1 + 2.4 MHz".

2.4.6 Using the Level Meter as a Detector Amplifier

The level meter can be used as a wideband or selective detector amplifier. All settings on the level meter are effected as for wideband or selective measurements. At jack Bu 7 with termination into Z = 75 Ω and zero instrument indication there is an output level of 0 dB/Np. With wideband operation the frequencies of the input and output voltage are equal, with selective operation the second intermediate frequency f_{IF2} = 100 kHz is produced.

2.5 Accessories

2.5.1 Voltage Recorder 3 V/30 kΩ (100 µA for full-scale deflection)

Connect the voltage recorder to the jack Bu 6 "Output" between the a- and c-wires. Insert a dummy plug in the b-wire (to operate a switching contact on the jack).

2.5.2 Current Recorder 77.5 /uA/2.5 kΩ

Connect the recorder to jack Bu 6 "Output" between the a- and b-wires. Wire c is connected to chassis.

UNIREG S is, for example, a suitable recorder, with a terminating resistance R = 2.5 kΩ.

2.5.3 Connection of Scale-spread Device B 977

Connect the scale-spread device B 977 via a balanced cord to jack Bu 6. While the level meter reads -8 to +2 dB/ -0.9 to +0.2 Np adjust the deflection of the scale-spread device also to 0 dB/Np with the zero point control. Level increments between ±0.02 and ±1 dB (±0.002 and ±0.1 Np) can then be read. To improve the signal-to-noise ratio with selective measurements depress key T4 "low-noise".

2.5.4 Headphone Output, Jack Bu 5

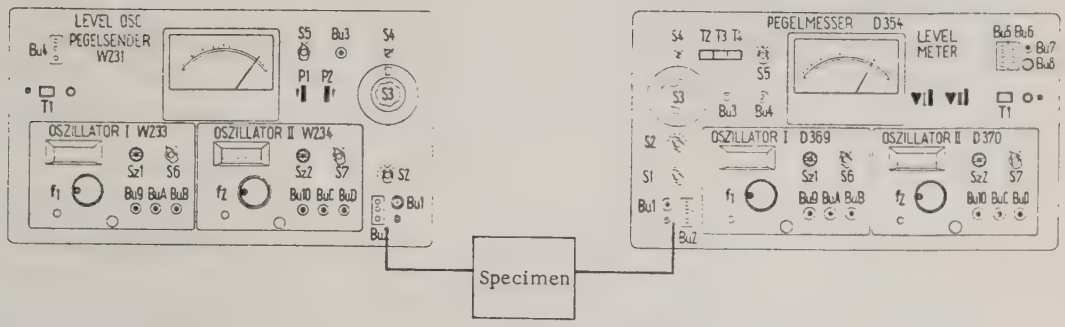
When measuring an amplitude-modulated input voltage there is a demodulated VF signal at jack Bu 5.

2.5.5 Connection of Level Tracer D 346

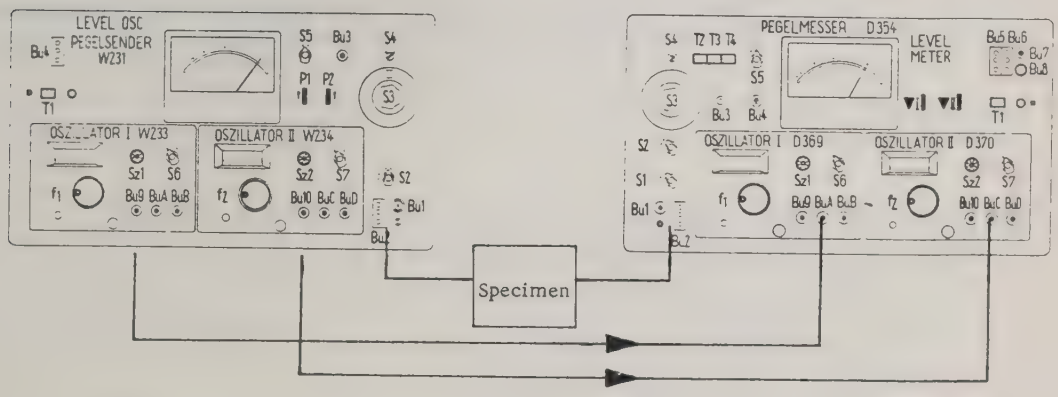
For measurements with level differences up to about 10 dB the wideband amplifier slide-in chassis D 918 of the level tracer is connected via a coaxial cord to jack Bu 7 of the level meter. Level meter and level tracer can be calibrated together so that absolute measurements are also possible.

To display level differences of up to 100 dB/11 Np, the logarithmic amplifier D 920 is connected to the ac output Bu4 (IF = 100 kHz). S3 must be set to the positions marked with a red spot.

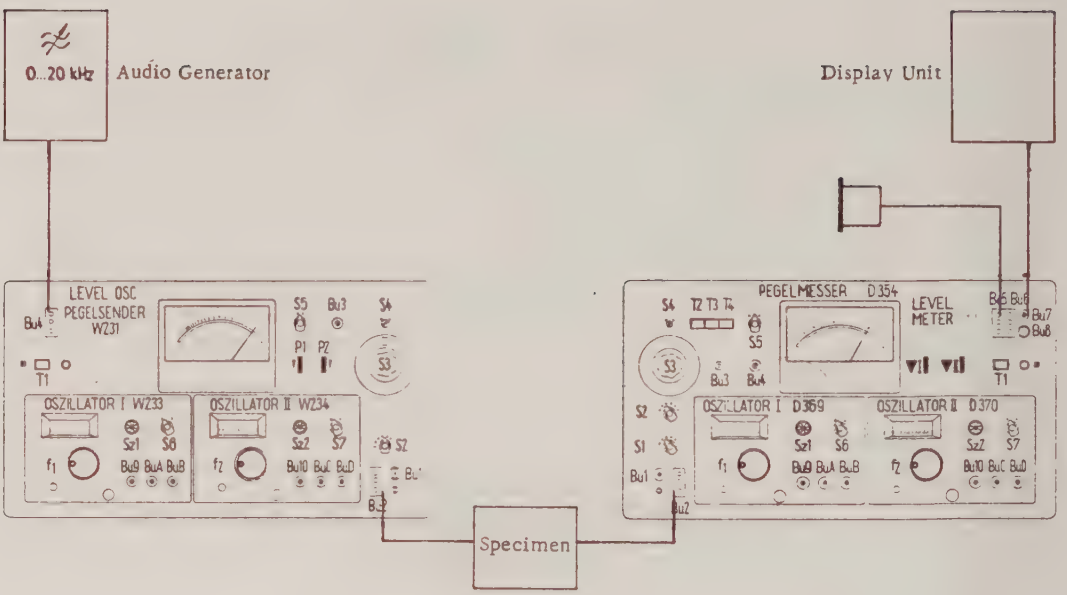
2.6 Typical Measuring Setups



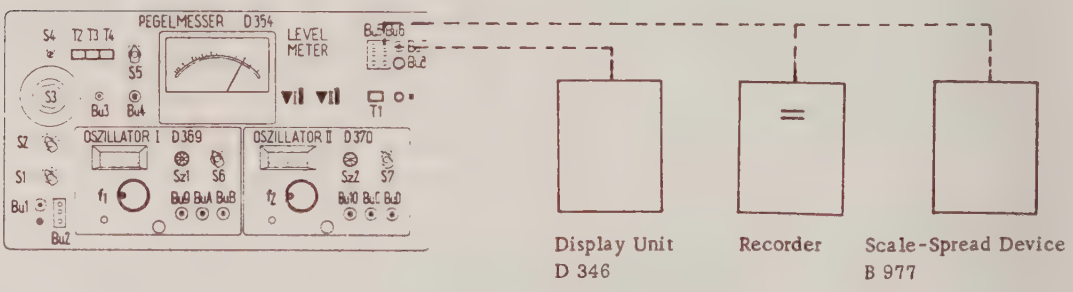
2.6.1 Wideband and Selective Level, Attenuation and Gain Measurements



2.6.2 Selective Level, Attenuation and Gain Measurements with Automatic Tuning f_1 and f_2 from the Level Oscillator



2.6.3 Measurements with Amplitude-modulated Transmitting Level and Monitoring with Headphone and Display Unit



2.6.4 Connection of Accessory Devices to the Level Meter (level tracer, recorder and scale-spread device)

3. NOTES ON MAINTENANCE

The devices contain components of high reliability and long useful life. Silicon transistors are used as active elements. As a result regular maintenance and scheduled supervision are not necessary.

3.1 Switches

The switches used are self-cleaning and require no special maintenance. Contact surfaces should never be treated with fat or grease-dissolving agents.

3.2 Replacing Indicating Lamps

for power and measuring-range indication

The indicating lamps have bayonet sockets: they can be removed by pushing in slightly, combined with a slight twist to the left. Use the lamp extractor contained in the spares bag (secured inside the device). All indicating lamps are accessible from the outside.

For replacing lamps in switch S3 unscrew the dial knob and the grey cover plate. When replacing these parts the left red ▼ sign, at the left stop of S3 and S4, must be above the right transparent window.

4. FAULT LOCATION

4.1. FAULT LOCATION ON THE DEENERGIZED DEVICE

4.1.1. As a first step, check the measuring setup. Check all connecting leads for firm seat of their plugs and satisfactory condition (for instance continuity resistance between wires and shield).

4.1.2. Check whether possibly an operating error has been committed on one of the units associated with the measuring setup.

4.1.3. Perform a visual examination.

4.2. FAULT LOCATION ON THE ENERGIZED DEVICE

Caution: When connecting the exposed chassis to the mains observe the safety code (for instance in Germany the rules of the VDE (Association of German Electrical Engineers) concerning rooms with electrical equipment)).
Entrust such work to skilled personnel only.

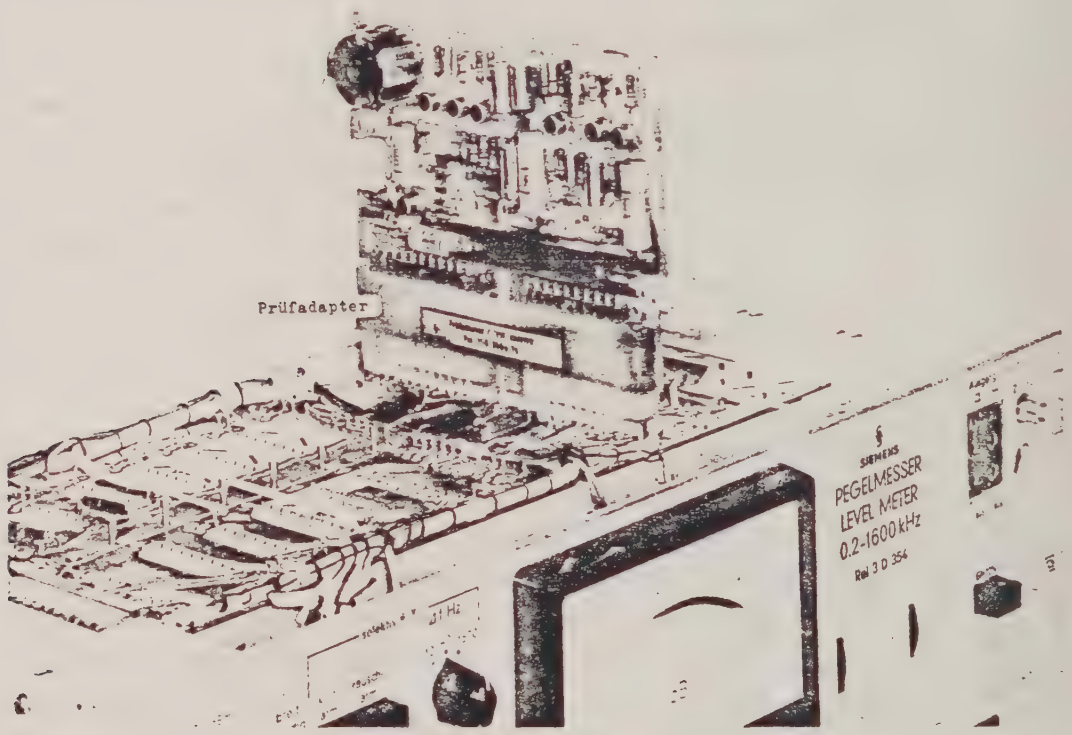
4.2.1. General Information

The main source of information for fault location is the circuit diagrams with entered measured values in the Circuit Diagrams part and the 'Fault Elimination' part as well as the test plan (annexed Fig.1). If the observed type of fault is mentioned in the following fault location table, a procedure according to the information given there will considerably reduce the time required for fault location. Observations of the user can be entered at the end of these tables. We shall be obliged by receiving such supplements and are gladly prepared to duplicate them for the benefit of other users.

All ac and dc voltage values mentioned in the circuit diagrams are averages from measurements using the instruments mentioned on page 4-5 of the Fault Elimination. Unless other tolerances are specified the measured values will be accurate to within ±15%.

Locating of the subassemblies, individual component parts and measuring points is facilitated by the wiring diagrams marked by "7402" in the last four digit places, e.g. wiring diagram for the level oscillator S45034-W231-B302-*-7402.

All plug-in circuit boards in the 'level oscillator' and 'level meter' mainframes and the oscillator plug-ins can be operated by way of the test adapter D640 included in the mainframe. For this purpose the circuit board is taken out of the holder and placed onto the test adapter bolted onto the wiring circuit board. This considerably facilitates fault location in a circuit board since good access is gained to the individual component parts and conducting foils.



Typical application of the test adapter D 640 (Prüfadapter = Test adapter)

The locating of a defective subassembly is also greatly facilitated by the measuring points lettered on the wiring circuit boards. If it is not possible for the user to remedy a fault himself it will mostly suffice merely to return the defective circuit board to the factory.

4.2.2. FAULT LOCATION TABLE FOR LEVEL OSCILLATOR W231 WITH OSCILLATOR I W233 AND OSCILLATOR II W234

Type of Fault	Fault Location
Output voltage is completely absent, no indication on the meter	According to annexed Fig. 1
Meter reading fails to agree with the actual output level	See Fault Elimination p. 11, Section 5.2.3.1.
The frequency response of the output level exceeds ±0.1 dB (±0.01 Np)	Switch S5 is not in the position automatic level control "on". In the case of low frequencies (less than 2 kHz) operate the impedance switch S2 to the range 0.2-5 kHz. Check the crystal diode Gr2 in the measuring circuit W738.
The level steps (switch S3) have a greater deviation than ±0.1 dB (±0.01 Np)	Check the attenuator W737
In the case of low mains voltages the output level decreases heavily	Check board 1 in power supply W741
No modulation of the output voltage is possible	Operate switch S5 to position "off", check board 2 'external modulator' W656; with an audio voltage of 3 V applied to the input Bu4 adjust R14 and C7 for 100% modulation and minimum harmonic distortion (e.g. by reference to an oscilloscope)
No level meter deflection in the case of f_1-synchronization of the level meter from the level oscillator	Adjust the frequency control f_2 on the level meter for maximum deflection. Measure the voltage at jack Bu9 with an RF-Multizet meter; nominal value: 0.27 V across 75 Ω

Type of Fault	Fault Location
No level meter reading with f_2-synchronization of the level meter from the level oscillator	Set the frequency tuning control f_1 on level oscillator and level meter to the same lock-in point. Measure the voltage at jack Bu10 with RF-Multizet meter, nominal value: 0.78 V across 600Ω. Operate switch S7 on the level meter to position "0-10 kHz". Select a pass-band width of 40 Hz or 1600 Hz with switch S5 on the level meter. If a pass-band width of 10 Hz is required (frequency range 200 Hz to 2 kHz) observe p. 32, Section 3.4. of the Notes on Maintenance.
No level meter reading with f_1- and f_2-synchronization of the level meter from the level oscillator	Observe the points for f_1-synchronization and f_2-synchronization. No frequency control is possible on the oscillators of the level meter.
When f_1 = 0 kHz with lock-in and f_2 = 0 kHz are set in the range "0-10 kHz" of switch S7, the reading fails to drop to $-\infty$ with switch S5 in position "off" and switch S2 on the range "0.2-5 kHz".	Set C2 on the oscillator II W234 in a way that the pointer of the instrument starts oscillating corresponding to the decreasing pulsation frequency, followed by ultimate dropping to $-\infty$. The frequency scale for f_2 is now calibrated.

5. FAULT ELIMINATION

5.1. GENERAL INFORMATION

The basis of fault eliminating is the circuit diagrams, wiring diagrams and parts lists. Proceed with particular care when replacing effective parts in etched circuit boards. If no suction-type soldering iron is available for unsoldering a component part, one had better cut out the respective component part from the circuit, followed by singly removing the remaining terminal ends. In this way damage to the metal foil can be avoided. When soldering into circuit temperature-sensitive components such as solid-state devices, Styroflex capacitors and small carbon-film resistors protect them with flat pliers from thermal destruction.

Besides individual information, the following sections contain instructions for aligning and the checks to be made on the individual subassemblies after repair work.

5.2. TESTING INSTRUCTIONS AND FAULT ELIMINATION ON THE LEVEL OSCILLATOR W231 WITH OSCILLATOR UNIT I W233 AND OSCILLATOR UNIT II W234

These instructions describe all essential tests for checking the electrical data and give the respective information for fault elimination. To eliminate a fault, once it is detected, only those sections need be observed reference to which is made in the FAULT LOCATION part.

Measuring Instruments Required:

1 frequency counter for up to 4 MHz, error $\pm 1 \times 10^{-6}$

1 dc multi-meter Zi = 50 kΩ/V,
e.g. Siemens /uA-Multizet meter

1 RF diode or electron-tube voltmeter,
e.g. Siemens RF-Multizet meter, 30 Hz to 450 MHz

1 calibrating level meter for checking the 0 dB(dBm,Np,Npm) marks

1 attenuator, e.g. D 120

1 distortion meter or selective level meter, e.g. D335/D2006

1 level scale-spread device B 977

1 variable-voltage power supply for setting the primary voltage

5.2.1. CHECKS ON THE OSCILLATOR I W233

5.2.1.1. Checking the Frequency Scale

Settings required: switch S6 "continuous"
all other controls arbitrary.

Connect the frequency counter to jack Bu 9 by way of a coaxial connecting cord. The measuring frequency shall be the sum of the setting f_1 on the film drive plus 2.4 MHz. If the need arises effect a correction f_1 = 1.6 MHz (corresponding to 4 MHz on the frequency counter) with the trimmer C1.

5.2.1.2. Checking the Output Level at the Jacks Bu 9 and Bu B

Settings required: switch S6 "continuous" "UNLOCKED"
all other control elements arbitrary.

Terminate the RF-Multizet meter into 75Ω and measure the output voltage at the jacks Bu 9 and Bu B in the frequency range of f_1 = 0-1.6 MHz.

Nominal value: 0.27 V ± 10%

5.2.1.3. Checking the Carrier Voltage for the Main Modulator on the Clip-contact Strip e1,2-e3,4 (⊥)

Settings required: switch S6 "continuous"
all other controls arbitrary.

Connect the RF-Multizet meter to the clip-contact strip e1,2-e3,4 (⊥) and measure the carrier voltage in the frequency range f_1 = 0-1.6 MHz.

Nominal value: 0.27 V ± 10%

5.2.1.4. Checking the Synchronization Input Jack Bu A

When a coaxial cable is connected to jack A the meter reading must decrease to $-\infty$.

When a level of -9 dB (-1 Np, 0 dBm/75Ω) is fed into jack A at a frequency of 2.5 MHz, the level oscillator W 231 must read again the level previously set on the instrument. If such is not the case check the contact-spring sets on jack A.

5.2.1.5. Checking the Holding and the Pull-in Range

Settings required: switch S6 "with lock-in"
all other controls arbitrary.

The visual indicator Sz1 for lock-in monitor[illegible] (no current), if the frequency control f_1 is set to a [illegible] point n × 10 kHz. When the film drive is between two lock-in points, a visual indicator Sz1 must read "red" (current flowing).

The holding range is that range where, with slow rotation of the film drive to the left and the right from a lock-in point, the visual indicator continues showing "green". It is within this range that the output frequency is adjusted to this lock-in point. The holding range is to be about ± 1.8 kHz.

The pull-in range is that range within whose limits the frequency control circuit effects a "pull-in" action, i.e. the visual indicator Sz1 restores to show "green". The pull-in range shall amount to about ± 1.2 kHz and be symmetrical about the lock-in point. If the need arises, effect such an alignment with R1[illegible] in the spectrum oscillator board 2 W668 that a 5.6 V dc is measured at the collector of transistor Ts5 when the frequency control f_1 is set between two lock-in points (Sz1 red).

5.2.1.6. Accuracy of the 100-kHz Crystal

Settings required: f_1 = 4 MHz 1600 mHz
S6"with lock-in"
all other controls arbitrary.

Measure the output frequency with a frequency counter connected to jack Bu 9.

Nominal value: 4,000,000 ± 40 Hz

If an alignment is required, use trimmer C1 in the spectrum oscillator board 3 W669.

5.2.2. CHECKS ON THE OSCILLATOR II W234

5.2.2.1. Checking the Frequency Scale

Settings required: switch S7 "0 to 10 kHz"
all other controls arbitrary.

Connect the frequency counter with a coaxial cord to a jack Bu 10. The measuring frequency f_{02}' shall be equal to the difference of 60 kHz and the frequency setting f_2, i.e. f_2 = 0 kHz corresponds to f_{02}' = 60 kHz, f_2 = 10 kHz corresponds to f_{02}' = 50 kHz. If the deviations exceed ± 30 Hz effect an alignment with

trimmer C2, if the need arises effect a coarse alignment with trimmer C10 in the interpolator board 1 W671.

5.2.2.2. Checking the Output Level at the Jacks Bu10 and Bu D

Settings required: switch S7 "0 - 10 kHz"
all other controls arbitrary.

Terminate the RF Multizet meter into 600Ω and measure the output voltages at the jacks Bu 10 and Bu D in the frequency range of f_2 = -3 to 13 kHz.
Nominal value: 0.78 V ± 10%

5.2.2.3. Checking the Signal Voltage for the Main Modulator on the Clip-contact Strip $f_{30,31}$-$f_{28,29}$ (⊥)

Settings required: switch S7 "0 - 10 kHz"
all other controls arbitrary.

Connect the RF Multizet meter to the clip-contact strip $f_{30,31}$-$f_{28,29}$ (⊥) and measure the output voltage (f_{02} = 2.403 - 2.387 MHz) in the frequency range f_2 = -3 to 13 kHz.
Nominal value: 0.27 V ± 5%

5.2.2.4. Checking the Synchronization Input Jack Bu C

Settings required: switch S7 "0 - 10 kHz"
all other controls arbitrary.

When a coaxial cable is connected to jack C the visual indicator Sz2 must operate, showing "red".
When a signal of 0 dB (0 Np, 0 dBm/600Ω) is fed into circuit with a frequency of 60 kHz, the visual indicator Sz2 must restore again, i.e. it shows "green".

5.2.2.5. Checking the AFC Circuit

Settings required: switch S7 "0 - 10 kHz"
all other controls arbitrary.

When a level of 0 dB (0 Np, 0 dBm/600Ω) is fed into circuit the frequency range of 40 to 70 kHz, the visual indicator Sz2 must remain off (green).

5.2.2.6. Checking the Lock-in Point 0 kHz

Settings required: switch S7 "0 kHz"
f_1 = 100 kHz, S6 "with lock-in"
set about 0 dB (0 Np) on the meter by means of P1.

Connect the frequency counter to jack Bu 3 and measure the transmitting frequency.
Nominal value: 100,000 ± 1 Hz
With lock-in of f_1 and switch S7 in position "0 kHz" the accuracy of the transmitting frequency corresponds to that of the 100-kHz master crystal in the oscillator I.
When the above tolerance is exceeded, proceed as described under 5.2.1.6.

5.2.3. CHECKS ON THE LEVEL OSCILLATOR W231

5.2.3.1. Checking the Instrument Indication

Settings required: f_1 = 100 kHz
f_2 = 0 kHz
S2: 75 Ω
S3: 0
S4: dB or dBm (Np or Npm)
S5: on

Connect the calibrating level meter with Z = 75Ω to the coaxial output jack Bu 1 and set accurately a reference level of 0 dB (dBm, Np, Npm) with the level controls P1 (coarse) and P2(fine). If the deviations from the 0-mark on the meter of the level oscillator exceed 0.1 dB (0.01 Np) adjust R80 in the measuring field correspondingly.

5.2.3.2. Checking the Level Steps

Settings required: f_1 = 100 kHz
f_2 = 0 kHz
S2: 75 Ω
S4: dB or dBm (Np or Npm)
S5: on

Connect to the coaxial output Bu 1 the level meter D354 (Z=75Ω, measuring range -60 dB, dBm/-6 Np, Npm; T4 pushed, pass band 1600 Hz) by way of the attenuator D120.
Starting from the setting 0 dB, dBm, Np, Npm, check the error of the level steps by comparison with the attenuator.
Permissible error: ± 0.1 dB (±0.01 Np)
When the tolerance is exceeded check the attenuator W737 in the measuring field.

5.2.3.3. Measuring the Distortion Attenuation a_{k2} and a_{k3}

Settings required: f_1 = 100 kHz
f_2 = 0 kHz
S2: 75 Ω
S3: 0
S4: dB or dBm (Np or Npm)

The distortion attenuation a_{k2}, a_{k3} is determined by measuring the harmonics with a selective level meter. The ratio of the fundamental level and the harmonic level gives the distortion attenuation.

For the measurement connect the level meter D354 (Z = 75Ω, measuring range -50 dB, dBm/ -6 Np, Npm; T3 pushed, pass band width 40 Hz) to the output jack Bu 1 by way of a coaxial connecting cord. With the level meter tuned to 100 kHz the fundamental level is measured; with tuning to 200 and 300 kHz, respectively, the levels of the first and second harmonics, respectively, are measured.

Nominal values of the harmonic levels: <-54 dB/ <-6.3 Np

5.2.3.4. Dependence of the Output Level on the Mains Voltage

Settings required: f_1 = 100 kHz
f_2 = 0 kHz
S2: 75 Ω
S3: 0
S4: dB or dBm (Np or Npm)
S5: on

Connect the level oscillator to the ac mains by way of a variable-voltage transformer. Connect a level meter followed by level scale-spread unit to the jack Bu 1.

With an input voltage of 240 V (mains voltage adjuster S8 to 220 V) and 120 V, respectively, (mains voltage adjuster S8 to 110 V) adjust the scale-spread device for a reading of 0 dB, Np. When subsequently the input voltage is varied from 200 to 265 V and 100 to 140 V, respectively, the reading on the scale-spread unit must not change by more than ± 0.05 dB (± 0.005 Np).

FILM DRIVE, REPLACING THE SCALE FILM

The film drive is of rugged construction and requires no maintenance. The film tape which carries the scale divisions, individually applied by a photographic process, consists of particularly strong and permanent plastic special foil (Dupont Cronar Film No. 225 B 35) for the purpose of ensuring greatest accuracy in setting the frequency. Under normal conditions therefore, trouble need not be anticipated. Should a fault nevertheless occur, take down the film cassette with care, following the instructions given below and detect the fault. Never attempt to move the drive by using force. Should the film have been damaged, then insert the spare film by following these instructions. We recommend that the piece of negative film supplied with the equipment is forwarded to our works for making a new spare film after the removal of the spare film.

If the transport band (Fig. 4) has been torn, order a replacement under the order description of "Transport Band C44106-A7-C109 with 2 clips C44106-A7-C110". When placing the band in position, make sure that the lettering on the inner surface of the band is legible; insert the two clips into the overlapping perforations

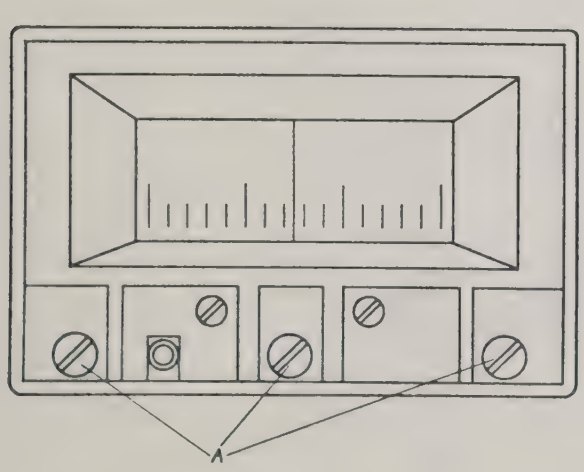


Fig. 1 Film guide

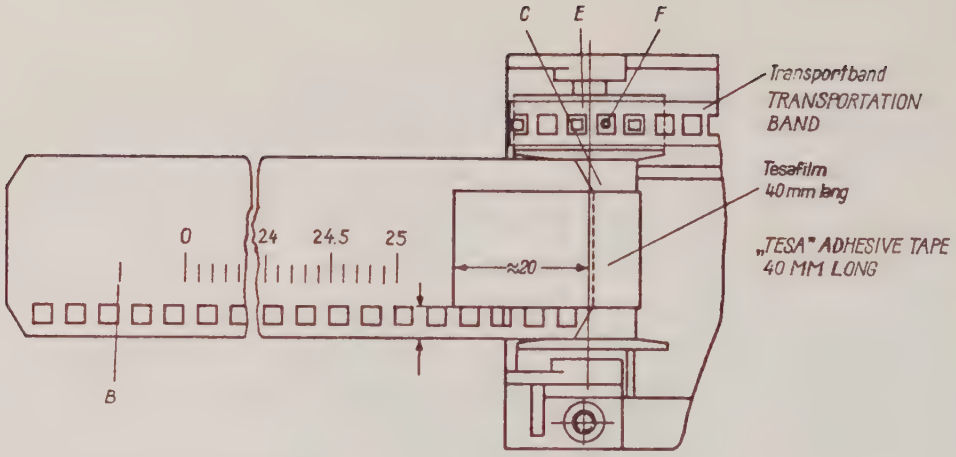


Bild 2 Ankleben des Filmband-Endes
FIG.2 CEMENTING THE END OF THE FILM BAND IN POSITION

Bild 3 Ankleben des Filmband-Anfangs
FIG.3 CEMENTING THE START OF THE FILM BAND IN POSITION

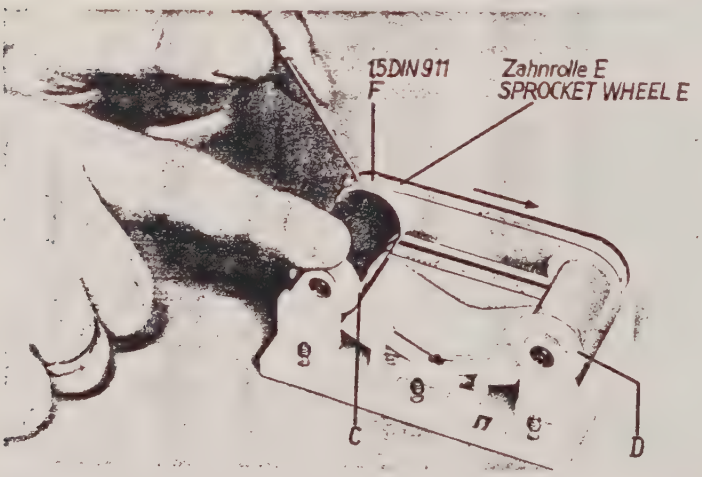


Bild 4 Lösen der Vorspannungs-Arretierung
FIG.4 RELEASING THE DETENT OF THE MECHANICAL BIAS

from inside and bend over. As the initial tension of the film rollers is lost when replacing the transport band, the film must also be inserted again in accordance with the instructions.

Taking Down the Film

1. Either the film cassette is accessible from the front of the unit or the unscrewing of only a partial front name plate or front name plate is required.
2. Turn film drive, if possible, as far as the left-hand stop (beginning of scale), failing this, roll the film by hand on to the left-hand roller after taking down the film cassette. (point 4).
3. Slacken fixing screws (A) of the film guide and pull out the film guide towards the front (Fig. 1).
4. Wind film completely on to roller C and detach adhesive strip from roller D (Fig. 3).
5. Unwind film from roller C and detach adhesive strip from roller C.Carefully remove any residue of adhesive from the rollers.

Inserting the New Film

The spare film must be rolled in such a manner that the lettering for the high frequencies is legible from the outside. Remove dust particles from the film guide with a soft brush, the proceed as follows:

6. Grasp roller C, turn sprocket roller E four turns counter-clockwise (the equalizing spring in roller C is tensioned during the process) and lock in this position by tightening the set screw F with an hexagon socket spanner 1.5 DIN 911, Fig. 4.
7. Stick adhesive strip (40 mm x 19 mm), e.g. "Tesafilm" adhesive strip, order No. 5859, Messrs. Beiersdorf, Hamburg, on to the legible end of the film in such a manner that 20 mm are left projecting (Fig. 2).

8. Stick end of film on to roller C (Fig. 2). The edge of the film must be parallel with the edge of the roller after glueing.

9. Roll film tightly on to roller C (Fig. 3) and grip until point 11 has been carried out.

10. Slip end of film (beginning of scale) only as far through the bearing support and stiffening piece until it can be taughtly glued on to the roller D.

11. Stick film on to roller D as described under points 7 and 8 (Fig. 3).

12. Slacken set screw F (Fig. 4). Spring tension must now be felt. If roller C is gripped and sprocket roller E given a quarter turn anticlockwise, the sprocket roller must return to its initial position when being released.

13. Turn one of the sprocket rollers until the first unlettered scale mark coincides exactly with the graduation mark in the scale window. (This mark designates the mechanical stop of the film drive).

14. The film drive must be at the left-hand end stop.

15. Insert film guide carefully without exerting pressure and note whether the film perforations drop into the sprocket.

16. Uniformly tighten the three fixing screws (A) of the film guide.

17. Verify for a second time that the film has been inserted correctly by checking the frequency calibration.

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Setting:

Level control P1 right-hand stop
f_1 = 100 kHz, S6: with lock-in
f_2 = 0 kHz, S7: 1 to 10 kHz
S5: Level control "off"

For the measuring and connecting points see:
S45034-W231-B302, B 602-x-7411
S45034-W231-B602-x-7402

1 Power supply I W 654

Measure the voltages to chassis ground at the points
C1, 2 +17 V
C12, 13 +35 V

Are the voltages present?

NO → Check the power supply I by reference to the circuit diagram and clear the fault

Is the fault cleared?

YES

2 Board 1
Power supply II W 741

Measure the voltages against chassis ground at the measuring points
5: +24 V
6: +10.3 V

Are the voltages present?

YES

NO → Check the power supply II by reference to the circuit diagram and clear the fault

Is the fault cleared?

YES

3 Measuring field W 736

Measure the transmitting level +16 dB/+1.7 Np Pin strip d 2, 3

Is the level present?

YES

NO → Look for the fault in the measuring field W 736

Is the fault cleared?

YES

4 Board 6
Amplifier W 660

Measure the level -29 dB/-3.4 Np at the amplifier input, measuring point 42 - 41 (⊥)

Is the level present?

YES

NO → Look for the fault in the amplifier W 660

Is the fault cleared?

YES

5 Board 5
1.6-MHz low-pass filter W 659

Measure the level -21 dB/-2.6 Np at the low-pass filter input b 20, 21

Is the level present?

NO

YES → Look for the fault in the low-pass filter W 659

Is the fault cleared?

NO

6 Oscillator I W 233

Measure the carrier voltage -9 dB/-1 Np at the measuring point 24 - 23 (⊥)

Is the voltage present?

YES

NO → Look for the fault in the oscillator I W 233

Is the fault cleared?

7 Oscillator II W 234

Measure the signal voltage -9 dB/-1 Np at the measuring point 4 - 3 (⊥)

Is the voltage present?

YES

NO → Look for the fault in the oscillator II W 234

Is the fault cleared?

8 Board 4
Main modulator W 658

Look for the fault in the main modulator

Fault location, symptom: No output voltage, no meter deflection (even when switch S5 is operated)

SIEMENS AKTIENGESELLSCHAFT
Wernerwerk für Weitverkehrs- und Kabeltechnik

Annexed Fig. 1

5. STÜCKLISTE

Vorbemerkung

Unter Symbol stehen die in den Stromläufen verwendeten Abkürzungen für die Bauteile in alphabetischer und - soweit möglich - in numerischer Reihenfolge. Mit Stück ist die Anzahl der gleichen Bauteile innerhalb der Geräte oder der Baugruppe bezeichnet. In der Spalte Gegenstand sind ausser dem Namen des Bauteils auch seine Hauptkennwerte angegeben. Mit der Bestellnummer ist das Bauteil durch einen Abkürzungs-Code oder eine Bauvorschrift eindeutig gekennzeichnet.

Es bedeuten:

bei einem Widerstand: 300 kΩ ±5 %; 0,5 W
- 300 kΩ . . . . . Nennwert des Widerstandes
- ±5 % . . . . . Toleranz des Nennwiderstandes
- 0,5 W . . . . . Belastbarkeit bezogen auf Umgebungstemperatur 20°C

bei einem Kondensator: 1000 pF ±20 %; 125 V-
- 1000 pF . . . . . Nennwert der Kapazität (1 pF = µµF = 10^{-12} F)
- ±20 % . . . . . Toleranz der Nennkapazität
- 125 V- . . . . . zulässige Betriebsgleichspannung

bei einem Übertrager:

Wicklg.I (1a,2a,3a)	Wicklg.II (rtsw,gesw, rtgn,gegnsw)+
440 Wdg 0,1 CuL 75 Ω	
228 µH ±2 %	720 Wdg HFL SS 60x0,03 35Ω
Abgriff(2a): 210 Wdg	1.Abgriff (gesw): 46 Wdg
	2.Abgriff (rtgn): 190 Wdg

Wicklg.I (1a,2a,3a)
- 440 Wdg . . . . . 440 Windungen, Anfang Lötöse 1a, Ende 3a;
- 0,1 CuL . . . . . aus Kupferdraht (Cu); 0,1 mm Ø; lackisoliert (L)
- 75 Ω . . . . . Gleichstromwiderstand der Wicklung I
- 228 µH . . . . . Induktivität
- Abgriff(2a): 210 Wdg . . Abgriff bei der 210.Windung, Lötöse 2a

Wicklg.II — sinngemäss wie bei Wicklung I
- HFL SS 60x0,03 . . . . . Hochfrequenzlitze 2fach seidenumsponnen (SS), aus Kupferdraht 60x0,03 mmØ

bei einem Gleichrichter: 50 V/250 mA
- 50 V . . . . . Anschluss-Wechselspannung
- 250 mA . . . . . entnehmbarer Betriebsstrom

+ Farbkurzzeichen

bl = blau	ge = gelb	gr = grau	sw = schwarz	rs = rosa
br = braun	gn = grün	rt = rot	ws = weiss	rtsw = rot/schwarz

5. PARTS LIST

Introductory remark

The "SYMBOL" column shows the abbreviations used in the circuit diagrams in alphabetic and, to the extent possible, numerical order. "QTY" denotes the number of identical components within the devices or the subassembly. The "DESCRIPTION" column gives, apart from the designation of the components, its principal characteristic data. The "ORDER NUMBER" column designates the component nonambiguously by an abbreviation code or a component specification.

There denotes, for instance

with a resistor: 300 kΩ ±5%; 0,5 W
- 300 kΩ . . . . . Nominal value of the resistance
- ±5% . . . . . Tolerance of the nominal resistance
- 0,5 W . . . . . Wattage rating, as referred to an ambient temperature of 20°C

with a capacitor: 1000 pF ±20%; 125 V-
- 1000 pF . . . . Nominal value of the capacitance (1 pF = 1 µµF = 10^{-12} F)
- ±20% . . . . . Tolerance of the nominal capacitance
- 125 V- . . . . . Permissible DC operating voltage

with a transformer:

Wicklg. I(1a,2a,3a)	Wicklg. II(rtsw,gesw, rtgn,gegnsw)+
440 Wdg 0,1 CuL 75 Ω	720 Wdg HFL SS 60x0,03 35 Ω
228 µH ±2%	1.Abgriff(gesw): 46 Wdg
Abgriff(2a): 210 Wdg	2.Abgriff(rtgn): 190 Wdg

Wicklg.I(1a,2a,3a)
- 440 Wdg . . . . 440 turns, start soldering lug 1a, end 3a
- 0,1 CuL . . . . of copper wire (Cu); 0.1 mm dia., enamelled (L)
- 75 Ω . . . . . DC resistance of winding I
- 228 µH . . . . . Inductance
- Abgriff(2a):210Wdg Tap at soldering lug 2a at the 210th turn

Wicklg. II . . . Analogously to winding I
HFL SS 60x0,03 . RF copper Litz wire, with double silk covering, 60x0.03 mm dia.

with a rectifier: 50 V/250 mA
- 50 V . . . . . Primary AC voltage
- 250 mA . . . . . Available operating current

+Color symbols

bl = blue	ge = yellow	gr = gray	sw = black	rs	= pink
br = brown	gn = green	rt = red	ws = white	rtsw	= red/black

Pegelsender 0,2...1600 kHz S45035-W231-B302,B602
LEVEL OSCILLATOR 0.2...1600 kHz

Ausführung -W231-B302: dB/dBm Eichung, MODEL dB/dBm CALIBRATION
Ausführung -W231-B602: Np/Kpm Eichung, MODEL Np/Npm CALIBRATION

Symbol SYMBOL	Stck QTY für Ausfg. FOR MODEL B302	Stck QTY für Ausfg. FOR MODEL B602	Gegenstand DESCRIPTION	Bestellangabe ORDERING DATA	Seite PAGE
	1	1	Verdrahtungsleiterplatte I PRINTED-CIRCUIT BOARD I	S45035-W681-B701	
	1	1	Verdrahtungsleiterplatte II PRINTED-CIRCUIT BOARD II	S45035-W684-A701	
	1	1	Adapter TEST ADAPTER	S45035-D640-A702	
	1	1	Netzteil I POWER SUPPLY UNIT I	S45035-W654-B701	5.3
Pl.1	1	1	Netzteilplatte II POWER SUPPLY UNIT II	S45035-W741-A701	5.3
Pl.2	1	1	Fremdmodulator EXTERNAL MODULATOR	S45035-W656-B701	5.4
Pl.3	1	1	Regelverstärker REGULATING AMPLIFIER	S45035-W657-A701	5.4
Pl.4	1	1	Hauptmod. + 2,4 MHz Tiefpaß MAIN MODULATOR + LOW PASS FILTER 2,4 MHz	S45035-W658-A701	5.4
Pl.5	1	1	1,6-MHz Tiefpaß 1,6-MHz-LOW-PASS FILTER	S45035-W659-B701	5.5
Pl.6	1	1	Verstärker AMPLIFIER	S45035-W660-B701	5.5
	1		Meßfeld m.Dickleitung MEASURING FIELD WITH VAR. ATTENUATOR	S45035-W736-A301	5.6
		1	Meßfeld m.Dickleitung MEASURING FIELD WITH VAR. ATTENUATOR	S45035-W736-A601	5.6
	1	1	Oszillator I (0...1600kHz) OSCILLATOR I	S45034-W233-A702	5.8
	1	1	Oszillator II (0...10 kHz) OSCILLATOR II	S45034-W234-A702	5.11
	1	1	Flachbeutel (Behälter für Kabel) CONTAINER FOR CONNECTING CORDS	V45030-T1	
	1	1	Netzanschlußleitung 1600mm grau POWER CORD	V45594-F4-A522	
	2	2	Koax. Verbindungsleitung 1,6/5,6 100Ohm COAX CONNECTING CORD	V42251-C113-A102	
	1	1	Anschlußleitung f. Instr. 320mm rot CONNECTING CORD FOR INSTRUMENT (RED)	V42257-B17-C15	
	1	1	Anschlußleitung f. Instr. 320mm blau CONNECTING CORD FOR INSTRUMENT (BLUE)	V42257-B17-D15	
			Schichtdrehwiderstand LAYER-TYPE VAR RESISTOR		
R1	1	1	500 Ohm ±20%; 0,1W; lin	W40101-F8501-M001	
R2	1	1	200 Ohm ±20%; 0,1W; lin	W40101-F8201-M001	
R3	1	1	Schichtwiderstand LAYER-TYPE RESISTOR 150 Ohm ±5%; 0,33W	B54413-A2151-J	
P1,P1'	1	1	Tandempot. kel wd 150b TANDEM POTENTIOMETER 2x1kOhm ±10%; 0,2W; lin	V45215-Z3004-B1	
P2	1	1	Feinregler 9 kel wd 10c POTENTIOMETER (FINE) 500 Ohm ±20%; 0,2W; lin	W40102-F8201-M001	
	2	2	Blende CAP	C44300-A7-C4	
Bu3	1	1	Gerate-Buchse 1,6/5,6 JACK	C42334-A76-A14	
	1	1	Masse-Buchse JACK	C42334-P3-C1	
S5	1	1	Betriebsartenschalter FUNCTION SWITCH	C44315-A14-A5	
J	1	1	Instrument 100µa;Ri=3k INSTRUMENT Ms sdr 518 Pv2 Pos.1	V70349-A578-A2	
	2	2	Signallampe Ersatz für SL 1,3 24V/0,6W SIGNAL LAMP (SPARES)	Fg lp 62be	
	1	1	Blende (farblos, matt.) LAMP CAP (COLOURLESS, FROSTED)	Fg lp 68a	

für Ausfg. FOR MODEL -B302	für Ausfg. FOR MODEL -B602			
1	1	Lampenzieher LAMP EXTRACTOR	C44121-A9-C1	
1	1	Sechskantstiftschlüssel HEXAGONAL SOCKET-WRENCH	D911-A15	
1	1	Drehknopf KNOB	C44326-A6-B11	
2	2	Drehknopf KNOB	C44106-A1-A2	
1	1	Knebelgriff KNOB	Rel antr 93c	
1	1	Skalenscheibe SCALE-DISC	C44326-A6-C21	
1	1	Blechgehäuse SHEET METAL CASING	C44165-A12-A2	
2	2	Druckstück PRESSING UNIT Rel bschl 29c	C40123-A29-A3	
1	1	Lotstützpunkt SOLDERING CONNECTION POINT	Rel ltg 5191	
2	2	Federleiste CLIP CONTACT STRIP 21 PINS	C42334-A5e-A1	

Netzteil I S45035-W654-B701
POWER SUPPLY UNIT I

	1	Netzeingang MAINS INPUT	S45035-W666-A701
	1	Gleichrichterplatte RECTIFIER BOARD	S45035-W685-A701
R1	1	Schichtwiderstand LAYER-TYPE RESISTOR 360 Ohm ±5%; 0,33W	B54413-A2361-J
T1	1	Drucktastenschalter PUSHBUTTON SWITCH	C44315-Z2-C1
Bu4	1	Buchseneinheit JACK PLATE	Rel kli 6a
	1	Lampenfassung LAMP HOLDER	C42230-A3-A1
SL1	1	Signallampe SIGNAL LAMP 24V 0,6W	Fg lp 62be
	1	Behälter für Ersatzteile CONTAINER FOR SPARES	C44165-A11-C2

Netzeingang S45035-W666-A701
MAINS INPUT

Tr1	1	Netztransformator POWER TRANSFORMER Wicklg. I (AI, EI) 826 Wdg. 0,22 CuL; 45 Ohm Wicklg.II (AII, EII) 826 Wdg. 0,22 CuL; 50 Ohm Wicklg.III (4b, 5b) 156 Wdg. 0,18 CuL; 16 Ohm Wicklg.IV (6b, 2b) 215 Wdg. 0,40 CuL; 4,5 Ohm Abgriff: (1c) 205 Wdg. Wicklg. V (3c, 5c) 113 Wdg. 0,40 CuL; 2,5 Ohm Abgriff: (4c) 108 Wdg.	Rel Bv 621 C 3126
S8	1	Netzeinbaustecker mit Spannungswähler POWER SOCKET WITH VOLTAGE ADJUSTER	Rel Bv 654 A 3001

Gleichrichterplatte S45035-W685-A701
RECTIFIER BOARD

		Elko ELECTROLYTIC CAPACITOR	
C1	1	250 µF +50-20%; 70V	B41611-B8257-S
C2	1	250 µF +50-20%; 35V	B41611-B7257-S
Gr1,2	2	Silizium Kleingleichrichter SILICON RECTIFIER B40 C2000	V23212-C1406

Pl.1 Netzteil II S45035-W741-A701
POWER SUPPLY UNIT II

		Schichtwiderstand LAYER-TYPE RESISTOR	
R1	1	2,7kOhm ±5%; 0,25W	B51263-A2272-J
R2,8	2	2,4 Ohm ±5%; 0,5W	B54414-A202C-J
R3	1	1,8kOhm ±5%; 0,25W	B51263-A2182-J
R4,10	2	1kOhm ±5%; 0,25W	B51263-A2102-J
R5	1	6,8kOhm ±5%; 0,25W	B51263-A2682-J

R7	1	4,7kOhm ±5%; 0,25W	B51263-A2472-J
R9	1	2,2kOhm ±5%; 0,25W	B51263-A2222-J
R11	1	510 Ohm ±5%; 0,33W	B54413-A2511-J
R13	1	7,5kOhm ±5%; 0,25W	B51263-A2752-J
R14,15	2	3kOhm ±5%; 0,25W	B51263-A2302-J
R6,12	2	Schichtdrehwiderstand LAYER-TYPE VAR RESISTOR 2kOhm ±20%; 1W; lin	W40955-D8202-M001
C1,2, C3	3	Tantal-Elko TANTALUM ELECTROLYTIC CAPACITOR 47/uF ±20%; 35V	B45170-A4476-M
C4,5	2	Keramik-Kondensator CERAMIC CAPACITOR 4700pF +30-20%; 500V	B37632-B5472-R001
Gr1	1	Si-Gleichrichter SILICON RECTIFIER 60V 300mA	V23212-B0520
Gr2,3 Gr4	3	Zenerdiode ZENER DIODE Z7	Q62702-Z339-P4
		Transistor TRANSISTOR	
Ts1,5	2	2 N 3054	Q62702-U7
Ts2	1	BCY 59 / VIII	Q60203-Y59-H
Ts3,6 Ts7	3	BCY 58 / VIII	Q60203-Y58-H
Ts4	1	2 N 3250a	Q62702-S167
Ts8	1	2 N 3250	Q62702-P76
	2	Kühlring für Ts2,6 COOLER-SLEEVE NF 203	C43055-Z1-C1

Fl.2 Frequenzmodulator S45035-W656-B7C1
EXTERNAL MODULATOR

		Schichtwiderstand LAYER-TYPE RESISTOR	
R1	1	5,6kOhm ±5%; 0,25W	B51263-A2562-J
R2	1	1,5kOhm ±5%; 0,25W	B51263-A2152-J
R3	1	350 Ohm ±5%; 0,33W	B54413-A2351-J
R4	1	22kOhm ±5%; 0,25W	B51263-A2223-J
R5	1	8,2kOhm ±5%; 0,25W	B51263-A2822-J
R6	1	560 Ohm ±5%; 0,33W	B54413-A2561-J
R7	1	4,7kOhm ±5%; 0,25W	B51263-A2472-J
R8	1	680 Ohm ±5%; 0,33W	B54412-A2681-J
R9.. R12	4	1kOhm ±1%; 0,33W	B54413-A9102-F
R13	1	6,2kOhm ±5%; 0,25W	B51263-A2622-J
R15	1	1,2kOhm ±5%; 0,25W	B51263-A2122-J
R16	1	3,9kOhm ±5%; 0,25W	B51263-A2392-J
R20	1	390 Ohm ±5%; 0,33W	B54413-A2391-J
		Schichtdrehwiderstand LAYER-TYPE VAR RESISTOR	
R14	1	500 Ohm ±20%; 1W; lin	W40955-A8501-M001
R17	1	100 Ohm ±20%; 1W; lin	W40955-A8101-M001
	2	Staubschutzkappe PROTECTION-CAP	C44408-Z3-C4
		Übertrager TRANSFORMER	
Ü1	1	9 Rel sp 5 m	Rel Bv 622 M 3551
Ü2	1	9 Rel sp 6h	Rel Bv 622 P 3416
L1	1	Schwingkreisspule OSCILLATOR COIL Rel sp 82h	Rel Bv 622 W 3031
L2	1	Drossel REACTOR 14/uH / 0,5A	B82501-A-C5
C1,4 C5,8	4	MKH-Kondensator MKH-CAPACITOR 0,01/uF ±20%; 250V	B32220-K3103-M
C2	1	Keramik-Kondensator CERAMIC CAPACITOR 39pF ±5%; 500V	B38225-J5390-J
C6	1	Kf-Kondensator PLASTIC-FOIL CAPACITOR 1600pF ±1%; 125V	B31141-A1162-F
C10,11	2	MKL-Kondensator MKL-CAPACITOR 0,1/uF ±20%; 100V	B32110-D0104-M
C12	1	MKH-Kondensator MKH-CAPACITOR 0,1/uF ±20%; 250V	B32220-K3104-M
		Lufttrimmer AIR-DIELECTRIC TRIMMER	
C3	1	3,5...54pF	Rel ko 130cd
C7	1	1,9...11pF	Rel ko 131f
C9	1	3...43pF	Rel ko 130cc
Md2	1	Diodenquartett DIODE QUARTET 4 x CA 90	V42292-E4-A1
Ts1,2 Ts3	3	Transistor TRANSISTOR BCY 58 / VIII	Q60203-Y58-H
	2	Isolierperle BEAD	C42187-Z7-C2

Fl.3 Regelverstärker S45035-W657-A701
REGULATING AMPLIFIER

		Schichtwiderstand LAYER-TYPE RESISTOR	
R1	1	82 Ohm ±5%; 0,33W	B54413-A2820-J
R5,13	2	200 Ohm ±5%; 0,33W	B54413-A2201-J
R6	1	160kOhm ±5%; 0,25W	B51263-A2164-J
R8	1	56 Ohm ±5%; 0,33W	B54413-A2560-J
R10	1	18kOhm ±5%; 0,25W	B51263-A2183-J
R11	1	6,8kOhm ±5%; 0,25W	B51263-A2682-J
R12	1	470 Ohm ±5%; 0,33W	B54413-A2471-J
R15	1	1700hm ±5%; 0,33W Wert wie eingebaut VALUE AS MOUNTED	B54413-A2271-J
R16	1	1500hm ±5%; 0,33W	B54413-A2151-J
R7	1	Thermewid THERMEWID RESISTOR K11a/ 20kOhm ±5%	Q63011-K203-J
Ü1	1	Übertrager TRANSFORMER 9 Rel sp 5n	Rel Bv 622 N 3552
L1	1	Spule COIL Rel sp 82h	Rel Bv 622 W 3031
C1	1	MKL-Kondensator MKL-CAPACITOR 1/uF ±20%; 63V	B32110-D9105-M
C4	1	Keramik-Kondensator CERAMIC CAPACITOR 39pF ±5%; 500V	B38225-J5390-J
C6	1	MKH-Kondensator MKH-CAPACITOR 0,01/uF ±20%; 250V	B32220-K3103-M
C7	1	MKL-Kondensator MKL-CAPACITOR 0,1/uF ±20%; 100V	B32110-C0104-M
C5	1	Lufttrimmer AIR-DIELECTRIC TRIMMER 3,5...54pF	Rel ko 130cd
Ts1,2	2	Transistor TRANSISTOR BCY 58 / VIII	Q60203-Y58-H
	2	Halterung für Ts1,2 MOUNTING FOR Ts1,2	C42121-A11-C10
	2	Isolierperle BEAD	C42187-Z7-C2

Fl.4 Hauptmodulator und 2,4-MHz-Tiefpaß S45035-W658-A7C1
MAIN MODULATOR + LOW-PASS FILTER 2,4 MHz

		Schichtwiderstand LAYER-TYPE RESISTOR	
R1	1	10kOhm ±5%; 0,25W	B51263-A2103-J
R2	1	2,2kOhm ±5%; 0,25W	B51263-A2222-J
R3	1	2,7kOhm ±5%; 0,25W	B51263-A2272-J
R4,10	2	100 Ohm ±5%; 0,33W	B54413-A2101-J
R5,22	2	470 Ohm ±5%; 0,33W	B54413-A2471-J
R6	1	6,8kOhm ±5%; 0,25W	B51263-A2682-J
R7,23	2	1,5kOhm ±5%; 0,25W	B51263-A2152-J
R8	1	27 Ohm ±5%; 0,33W	B54413-A2270-J
R9	1	120 Ohm ±5%; 0,33W	B54413-A2121-J
R11 ..14	4	1kOhm ±1%; 0,33W	B54413-A9102-F
R15	1	5,6kOhm ±5%; 0,25W	B51263-A2562-J
		Schichtwiderstand LAYER-TYPE RESISTOR	
R16	1	27kOhm ±5%; 0,25W	B51263-A2273-J
R17	1	390 Ohm ±5%; 0,33W	B54413-A2391-J

R18,19	2	200 Ohm ±1%; 0,33W	B54413-A9201-J
R20,21	2	18kOhm ±5%; 0,25W	B51263-A2183-J
R24	1	1kOhm ±5%; 0,33W	B54413-A2102-J
		Übertrager TRANSFORMER	
Ü1	1	9 Rel sp 5n	Rel Bv 622 N 3553
Ü2	1	9 Rel sp 5a	Rel Bv 622 N 3554
		Filterspule FILTER COIL	
L1	1	9 Rel sp 5p	Rel Bv 622 N 3555
L2	1	9 Rel sp 5p	Rel Bv 622 N 3556
		Drossel REACTOR	
L3	1	14 µH/0,5A	B82501-A-C5
C1,2,4 C6,7 C12,18	7	MKH-Kondensator MKH-CAPACITOR 0,01 µF ±20%; 250V	B32220-K3103-M
C3,5 C8,9 C10	5	MKL-Kondensator MKL-CAPACITOR 0,1 µF ±20%; 100V	B32110-C0104-M
C19	1	Tantal-Elko TANTALUM ELECTROLYTIC CAPACITOR 22 µF ±20%; 15V	B45170-A2226-M
C11	1	MKL-Kondensator MKL-CAPACITOR 2,2 µF ±20%; 63V	B32110-D9225-M
		Kf- Kondensator PLASTIC-FOIL CAPACITOR	
C13	1	116pF ± 1%; 500V	B31141-A5111-F
C14	1	125pF ±1%; 500V	B31141-A5121-F500
		Kf-Kondensator PLASTIC-FOIL CAPACITOR	
C15	1	275pF ±1%; 500V	B31141-A5271-F500
C16	1	36pF ±1pF; 500V	B31141-A5360-F
C17	1	165pF ±1%; 500V	B31141-A5161-F500
Md1	1	Diodenquartett DIODE QUARTET 4 x GA 90	V42290-Z4-A1
Gr1 ..4	4	Diode DIODE GA 90	Rel TL 672 R 108
Gr5	1	Zenerdiode DIODE ZENER Z7	Q62702-Z339-Z7
Ts1 ..4	4	Transistor TRANSISTOR BCY 58 / VIII	Q60203-Y58-H
	4	Halterung für Ts 1..4 MOUNTING FOR Ts 1..4	C42121-A11-C10
	1	Halterung für Gr 5 MOUNTING FOR Gr 5	C42121-A9-A1

Pl.5 1,6-MHz-Tiefpaß S45035-W659-B701
1,6-MHz-LOW-PASS FILTER

		Schichtwiderstand LAYER-TYPE RESISTOR	
R1,3	2	1kOhm ±1%; 0,33W	B54413-A9102-F
R2	1	12kOhm ±5%; 0,25W	B51263-A2123-J
R4	1	470 Ohm ±5%; 0,33W	B54413-A2471-J
		Filterspule FILTER COIL	
L1,5	2	9 Rel sp 75p	Rel Bv 622 T 3062
L2	1	9 Rel sp 75p	Rel Bv 622 T 3063
L3	1	9 Rel sp 75p	Rel Bv 622 T 3064
L4	1	9 Rel sp 75p	Rel Bv 622 T 3065
		Drossel REACTOR	
L6	1	14 µH/0,5A	B82501-A-C5
		Kf- Kondensator PLASTIC-FOIL CAPACITOR	
C1	1	78pF ±1pF; 500V	B31141-A5780-F
C2	1	61pF ±1pF; 500V	B31141-A5810-F
C3	1	59pF ±1pF; 500V	B31141-A5590-F
C4	1	110pF ±1%; 500V	B31141-A5111-F
C5	1	135pF ±1%; 500V	B31141-A5131-F500
C6	1	16pF ±1pF; 500V	B31141-A5160-F
C7	1	106pF ±1%; 500V	B31141-A5101-F500
C9	1	MKL-Kondensator MKL-CAPACITOR 0,1 µF ±20%; 100V	B32110-D0101-M
Ts1	1	Transistor TRANSISTOR BCY 58 / VIII	Q60203-Y58-H
	1	Halterung für Ts1 MOUNTING FOR Ts1	C42121-A11-C10

Pl.6 Verstärker S45035-W660-B701
AMPLIFIER

		Schichtwiderstand LAYER-TYPE RESISTOR	
R1	1	20kOhm ±5%; 0,25W	B51263-A2203-J
R2	1	4,3kOhm ±5%; 0,25W	B51263-A2432-J
R3,16 R17	3	2,7kOhm ±5%; 0,25W	B51263-A2272-J
R4	1	430 Ohm ±5%; 0,33W	B54413-A2431-J
R5	1	120 Ohm ±1%; 0,33W	B54413-A9121-F
R6,19	2	2kOhm ±5%; 0,25W	B51263-A2202-J
R7	1	15kOhm ±5%; 0,25W	B51263-A2153-J
		Schichtwiderstand LAYER-TYPE RESISTOR	
R8	1	2,2kOhm ±5%; 0,25W	B51263-A2222-J
R9	1	2,2kOhm ±1%; 0,1W	B51263-A9222-F
R10	1	1,6kOhm ±5%; 0,25W	B51263-A2162-J
R11	1	1,5kOhm ±5%; 0,25W	B51263-A2152-J
R12	1	120 Ohm ±5%; 0,33W	B54413-A2121-J
R15	1	22kOhm ±5%; 0,25W	B51263-A2223-J
R18	1	150 Ohm ±1%; 0,33W	B54413-A9151-F
R20	1	10kOhm ±2%; 0,25W	B51263-A2103-G
R21	1	1kOhm ±2%; 0, 33W	B54413-A2102-G
R23	1	220 Ohm ±5%; 0,33W	B54413-A2221-J
R24	1	1,2kOhm ±2%; 0,25W	B51263-A2122-G
R25	1	120 Ohm ±2%; 0,33W	B54413-A2121-G
R26	1	1,5kOhm ±1%; 0,1W	B51263-A9151-F
R27	1	6kOhm ±2%; 0,25W	B51263-A2602-G
R30	1	600 Ohm ±2%; 0,33W	B54413-A2601-G
R32	1	100 Ohm ±5%; 0,33W	B54413-A2101-J
R33,34	2	27 Ohm ±1%; 0,33W	B54413-A9270-F
R35	1	51 Ohm ±5%; 0,33W	B54413-A2510-J
R22,31	2	Schichtdrehwiderstand LAYER-TYPE VAR RESISTOR 200 Ohm ±20; 1W; lin	W40955-D8201-M001
L1	1	Drossel REACTOR 1 µH/1,15A	C44330-Z5-C8
C1,11	2	MKL-Kondensator MKL-CAPACITOR 4,7 µF ±20%; 63V	B32110-D9475-M
C2	1	Tantal-Elko TANTALUM ELECTROLYTIC CAPACITOR 150 µF ±20%; 15V	B45170-A2157-M
C3	1	MKH-Kondensator MKL-CAPACITOR 0,01 µF ±20%; 250V	B32220-J3103-M
C4,12 C14	3	Keramik-Kondensator CERAMIC CAPACITOR 8pF ±0,5pF; 500V	B38222-A5080-D
C5	1	Tantal-Elko TANTALUM ELECTROLYTIC CAPACITOR 100 µF ±20%; 10V	B45170-A1107-M
C6	1	MKL-Kondensator MKL-CAPACITOR 1 µF ±20%; 63V	B32110-D9105-M
C7	1	Keramik-Kondensator CERAMIC CAPACITOR 4pF ±0,5pF; 500V	B38222-A5040-D
C10,17	2	Tantal-Elko TANTALUM ELECTROLYTIC CAPACITOR 47 µF ±20%; 35V	B45170-A4476-M
C13	1	MKL-Kondensator MKL-CAPACITOR 2,2 µF ±20%; 63V	B32110-D9225-M
C16	1	Tantal-Elko TANTALUM ELECTROLYTIC CAPACITOR 22 µF ±20%; 35V	B45170-A4226-M
C18	1	68 µF ±20%; 20V	B45170-A3686-M

			Transistor TRANSISTOR	
Te1 ..7	7		BCY 58 / VIII	Q60203-T58-H
Te8,9	2		2 N 2218	Q62702-S0002
	7		Halterung für Te 1..7 MOUNTING FOR Te 1..7	C42121-A11-C10
	2		Halterung für Te 8,9 MOUNTING FOR Te 8,9	C42121-A11-C6
	2		Kühlschelle für Te 8,9 COOLER-SLEEVE FOR Te 8,9 HF 207	C42121-Z21-C2
	8		Isolierperle BEAD	C42187-Z7-C2

Meßfeld mit Nichleitung S45035-W736-A301,601
MEASURING FIELD WITH VAR. ATTENUATOR

für Ausfg. FOR MODEL			-A301 = dB/dBm Eichung/CALIBRATION -A601 = Np/Npm Eichung/CALIBRATION	
-A301	-A601			
1			Nichleitung 0..70dB VARIABLE ATTENUATOR	S45035-W737-A101
	1		Nichleitung 0..7Np VARIABLE ATTENUATOR	S45035-W737-A401
1	1		Meßkreis MEASURING CIRCUIT	S45035-W738-A701
1	1		Impedanzwandler IMPEDANCE CONVERTER	S45035-W739-A701
S2	1	1	Z-Schalter IMPEDANCE SWITCH	S45035-W740-A701
R31	1	1	Schichtwiderstand LAYER-TYPE RESISTOR 680 Ohm ±5%; 0,33W	B54413-A2681-J
Ü1	1	1	Übertrager TRANSFORMER	Rel Bv 621-E 3307
			Wicklg. I (1b,7b) 20 Wdg. 2x90x0,14 EFL S paral.; 0,16 Ohm	
			Wicklg.II (1a,6a) 20 Wdg. 2x90x0,04 EFl S paral.; 0,17 Ohm	
			Wicklg.III (1b,7b) 20 Wdg. 2x90x0,04 EFL S paral.; 0,18 Ohm Abgriff (3b): 10 Wdg.	
			Wicklg.IV (1a,6a) 20 Wdg. 2x90x0,04 EFL S paral.; 0,19 Ohm 1.Abgriff (3a): 5 Wdg. 2.Abgriff (5a): 10 Wdg.	
Ü2	1	1	Übertrager TRANSFORMER	Rel Bv 621 E 3310
			Wicklg. I (5a,4a) 80 Wdg. 0,55 CuL; 1,2 Ohm	
			Wicklg.II (4a,3a) 80 Wdg. 0,55 CuL; 1,2 Ohm	
			Wicklg.III (2b, EIV) 40 Wdg. 0,65 CuL; 0,45 Ohm	
			Wicklg. IV (5b, EIII) 40 Wdg. 0,65 CuL; 0,45 Ohm	
Ü2 Forts. CTD			Wicklg. V (6a,5b) 40 Wdg. 0,45 CuL; 0,90 Ohm	
			Wicklg. VI (1a,2b) 40 Wdg. 0,45 CuL; 0,90 Ohm	
S4	1	1	Drehschalter ROTARY SWITCH	C42315-A17-A10
SL3	1	1	Signallampe SIGNAL LAMP 24V/0,6W	Fg lp 62be
	1	1	Lampenfassung LAMP HOLDER	C42230-A3-A1
Bu2	1	1	Buchseneinheit JACK-PLATE	Rel kli 6a
Bu1	1	1	Koaxial-Buchse COAXIAL JACK 1,6/5,6	C42334-A76-A14

Eichleitung 0..70dB/0..7Np S45035-W737-A101, A401
VARIABLE ATTENUATOR 0..70dB/0..7Np

-A101	-A401		Metallschichtwiderstand METAL-FILM RESISTOR	
R1,15	2		289 Ohm ±0,2%; 0,25W	W40133-C6281-C903
R1,15		2	324,6 Ohm ±0,2%; 0,25W	W40133-C6321-C463
R2,4,5 R16,26	5		183,3 Ohm ±0,2%; 0,25W	W40133-C6181-C333
R2,4,5 R16,26		5	197 Ohm ±0,2%; 0,25W	W40133-C6191-C703
R3,6,17 R27,28	5		159,7 Ohm ±0,2%; 0,25W	W40133-C6151-C973
R3,6,17 R27,28		5	165,7 Ohm ±0,2%; 0,25W	W40133-C6161-C573
R7,29	2		155,4 Ohm ±0,2%; 0,25W	W40133-C6151-C543
R7,29		2	159,3 Ohm ±0,2%; 0,25W	W40133-C6151-C933
R8	1		213,2 Ohm ±0,2%; 0,25W	W40133-C6211-C323

für Ausfg. FOR MODEL				
-A101	-A401		Metallwiderstand METAL-FILM RESISTOR	
R8		1	176,3 Ohm ±0,2%; 0,25W	W40133-C6171-C633
R9,11 R12,18	4		742 Ohm ±0,2%; 0,25W	W40133-C6741-C203
R9,11 R12,18		4	544 Ohm ±0,2%; 0,25W	W40133-C6541-C403
R10,13 R20,22	4		2366 Ohm ±0,2%; 0,25W	W40133-B6232-C663
R10,13 R20,22		4	1503 Ohm ±0,2%; 0,25W	W40133-B6152-C023
R14,24	2		4216 Ohm ±0,2%; 0,25W	W40133-B6422-C163
R14,24		2	2481 Ohm ±0,2%; 0,25W	W40133-B6242-C813
R19	1		91,65 Ohm ±0,2%; 0,25W	W40133-C6910-C653
R19		1	98,48 Ohm ±0,2%; 0,25W	W40133-C6980-C483
R21	1		85,36 Ohm ±0,2%; 0,25W	W40133-C6850-C363
R21		1	90 Ohm ±0,2%; 0,25W	W40133-C6900-C003
R23	1		79,87 Ohm ±0,2%; 0,25W	W40133-C6790-C873
R23		1	82,86 Ohm ±0,2%; 0,25W	W40133-C6820-C863
R25	1		77,72 Ohm ±0,2%; 0,25W	W40133-C6770-C723
C1	1	1	Keramik-Kondensator CERAMIC CAPACITOR 1,5pF ±0,25pF; 500V	B38210-J5010-C500
S3	1	1	Kleindrehschalter MIDGET ROTARY SWITCH	C44315-A12-A26
			Leitung CABLE	
Le1,2	2	2		C44249-A8-C323
Le3	1	1		C44315-A12-C36
Le4,5 Le6	3	3		C44315-A12-C187
Le8,9	2	2		C44249-A8-C324
Le10	1	1		C44249-A8-C305
Le11	1	1		C44315-A12-C188
Le12	1	1		C44315-A12-C189
Le13	1	1		C44315-A12-C123
Le14	1	1		C44315-A12-..122

Meßkreis S45035-W738-A701
MEASURING CIRCUIT

			Schichtwiderstand LAYER-TYPE RESISTOR	
R77	1		1,8kOhm ±5%; 0,25W	B51263-A2182-J
R78,79 R83	3		1kOhm ±5%; 0,33W	B54413-A2102-J
R81	1		56kOhm ±5%; 0,25W	B51263-A2563-J
R82	1		3kOhm ±5%; 0,25W	B51263-A2302-J
R84	1		2kOhm ±5%; 0,25W	B51263-A2202-J
R80	1		Schichtdrehwiderstand LAYER-TYPE VAR RESISTOR 10kOhm ±20%; 0,1W; lin	W40118-F8103-M001
			MKL-Kondensator MKL-CAPACITOR	
C8,11	2		3,3/uF ±20%; 25V	B32110-C3335-M
C9	1		6,8/uF ±20%; 25V	B32110-C3685-M
			Tantal-Elko TANTALUM ELECTROLYTIC CAPACITOR	
C10	1		47/uF ±20%; 20V	B45170-A3476-M
C12	1		100/uF ±20%; 10V	B45170-A1107-M
Gr1,2	2		Diode DIODE OA 90 Type wie eingebaut TYPE AS MOUNTED	Mel TL 672 R 108

Impedanzwandler S45035-W739-A701
IMPEDANCE CONVERTER

			Metallwiderstand METAL-FILM RESISTOR	
R31	1		75 Ohm ±0,2%; 0,5W	W40133-D6750-C003
R32	1		2,54 Ohm ±2%; 0,125W	W40133-B6020-C542
R33	1		1,31 Ohm ±1%; 0,33W	W54413-A9010-F310
R34	1		2,68 Ohm ±2%; 0,125W	W40133-B6020-C682
R35	1		15,43 Ohm ±0,5%; 0,5W	W40133-D6150-D432
R36	1		53,04 Ohm ±0,2%; 0,5W	W40133-D6530-C043
			Schichtwiderstand LAYER-TYPE RESISTOR	
R38	1		510 Ohm ±5%; 0,33W	B54413-A2511-J

R39	1	22kOhm ±2%; 0,25W	B51263-A2223-C
R40	1	33kOhm ±5%; 0,25W	B51263-A2333-J
R41	1	100 Ohm ±5%; 0,33W	B54413-A2101-J
R42	1	1,2kOhm ±5%; 0,25W	B51263-A2122-J
R43	1	6kOhm ±2%; 0,25W	B51263-A2602-C
R44	1	600 Ohm ±2%; 0,33W	B54413-A2601-C
R46	1	220 Ohm ±5%; 0,33W	B54413-A2221-J
R47,48	2	27 Ohm ±5%; 0,33W	B54413-A2270-J
R49	1	51 Ohm ±5%; 0,33W	B54413-A2510-J
R45	1	Schichtdrehwiderstand LAYER-TYPE VAR RESISTOR 200 Ohm ±20%; 1W; lin	W40955-D8201-MC01
L1	1	UKW-Drossel VHF REACTOR 0,47/uH/2,2A	C44330-Z5-C7
C1	1	Tantal-Elko TANTALUM ELECTROLYTIC CAPACITOR 47/uF ±20%; 35V	B45170-A4476-M
C2	1	MKL-Kondensator MKL-CAPACITOR 1,5/uF ±20%; 63V	B32110-E9155-M
C3,5	2	Tantal-Elko TANTALUM ELECTROLYTIC CAPACITOR 22/uF ±20%; 35V	B45170-A4226-M
C4	1	Keramik-Kondensator CERAMIC CAPACITOR 12pF ±5%; 500V; N750	B38216-J5120-J
C6	1	Tantal-Elko TANTALUM ELECTROLYTIC CAPACITOR 180/uF ±20%; 25V	B45265-A4187-M
C	1	S-C-Relais DRY REED RELAY	V42280-E7-A5
Ta1,3 Ta4	3	Transistor TRANSISTOR 2 N 2218	Q62702-S0002
	3	Halterung MOUNTING	C42121-A11-C6
	3	Transistorkühler COOLER-SLEEVE	C42121-Z21-C4
Ta2	1	Transistor TRANSISTOR BCY 58 / VIII	Q60203-Y58-B
	1	Halterung MOUNTING	C42121-A11-C10
Gr3	1	Diode DIODE AA 118	Q60101-X118
S2		Z-Schalter B45035-W740-A701 IMPEDANCE SWITCH	
		Schichtwiderstand LAYER-TYPE RESISTOR	
R50,51 R62,63	4	300 Ohm ±0,2%; 0,15W	B51264-A9301-C
R52,61 R64	3	75 Ohm ±0,2%; 0,15W	B51264-A9750-C
R53,60	2	70 Ohm ±0,2%; 0,15W	B51264-A9700-C
R54,59	2	67,5 Ohm ±0,2%; 0,15W	B51264-A9670-C500
R55,58	2	62,5 Ohm ±0,2%; 0,15W	B51264-A9620-C500
R56,57	2	37,5 Ohm ±0,2%; 0,15W	B51264-A9370-C500
R65	1	125 Ohm ±0,2%; 0,15W	B51264-A9121-C500
R66	1	135 Ohm ±0,2%; 0,15W	B51264-A9131-C500
R67	1	140 Ohm ±0,2%; 0,15W	B51264-A9141-C
R68	1	150 Ohm ±0,2%; 0,15W	B51264-A9151-C
R69,70	2	600 Ohm ±0,2%; 0,15W	B51264-A9601-C
S2	1	Schalter SWITCH	C40315-M2162-I396

Oszillator I 0...1600kHz S45034-W231-A702
OSCILLATOR I 0...1600kHz

Verwendung: Pegelsender S45034-W231-B302, B602
USED IN: LEVEL OSCILLATOR S45034-W231-B302, B602

Symbol SYMBOL	Stck QTY	Gegenstand DESCRIPTION	Bestellangabe ORDERING DATA	Seite PAGE
P1.1	1	Rasteroszillator-Platte 1 SPECTRUM OSCILLATOR BOARD 1	S45035-W667-A701	
P1.2	1	Rasteroszillator-Platte 2 SPECTRUM OSCILLATOR BOARD 2	S45035-W668-A701	
P1.3	1	Rasteroszillator-Platte 3 SPECTRUM OSCILLATOR BOARD 3	S45035-W669-A701	
	1	Verdrahtungsleiterplatte PRINTED CIRCUIT BOARD	S45035-W670-A701	
R1,2	2	Schichtwiderstand LAYER-TYPE RESISTOR 75 Ohm ±1%; 0,33W	B54413-A9750-F	
C1	1	Lufttrimmer AIR-DIELECTRIC TRIMMER 1,3...5pF	Rel ko 131ac	
C3	1	Keramik-Kondensator CERAMIC CAPACITOR 2pF ±0,25pF; 500V	B38212-A5020-C	
K1	1	Drehko VAR. CAPACITOR 170/10 pF C001 ZZ195 (Fa.Valvo)	Rel TL 632 B 3002a2	
Sz1	1	Allsichtschauzeichen INDICATOR h'grün/orange br'green/orange	V45282-Z3009-A1	
S6	1	Kleindrehschalter MIDGET ROTARY SWITCH	C4C315-M3C3-N1	
	1	Kurbel-Drehknopf ROTARY KNOB FOR CRANK 37 ø	C44106-A2C-A2	
	1	Drehknopf ROTARY KNOB	C44106-A20-A3	
	1	Knebelgriff KNOB	Rel antr 93c	
Bu9	1	Gerätebuchse gerade COAX JACK 1,6/5,6	C42334-A76-A14	
		Schaltbuchse SWITCHING JACK		
BuA	1	1,6/5,6 (2u)	C42334-A76-A36	
BuB	1	1,6/5,6 (1u,1r)	C42334-A76-A34	
	1	Filmskalenantrieb FILM-SCALE DRIVE 1m grob/fein 1m COARSE/FINE	C44106-A7-A4	
	1	Membrankupplung MEMBRANE DRIVE COUPLING	C44106-A5-A61	

P1.1 Rasteroszillator-Platte 1 S45035-W667-A701
SPECTRUM OSCILLATOR BOARD 1

		Schichtwiderstand LAYER-TYPE RESISTOR	
R1	1	56kOhm ±5%; 0,25W	B51263-A2563-J
R2	1	18kOhm ±1%; 0,1W	B51263-A9183-F
R3	1	6,8kOhm ±1%; 0,1W	B51263-A9682-F
R4,29 R37	3	47 Ohm ±5%; 0,33W	B54413-A2470-J
R5,19 R28,36	4	1kOhm ±1%; 0,33W	B54413-A9102-F
R6	1	150 Ohm ±5%; 0,33W	B54413-A2151-J
R7	1	2,5kOhm ±1%; 0,1W	B51263-A9252-F
R8,9 R13	3	30kOhm ±1%; 0,1W	B51263-A9303-F
R10	1	47kOhm ±1%; 0,1W	B51263-A9473-F
R11	1	22kOhm ±1%; 0,1W	B51263-A9223-F
R12	1	47kOhm ±5%; 0,25W	B51263-A2473-J
R14	1	18kOhm ±5%; 0,25W	B51263-A2183-J
R15,22	2	15kOhm ±5%; 0,25W	B51263-A2153-J
R16,18,24	3	100 Ohm ±5%; 0,33W	B54413-A2101-J
R17	1	285 Ohm ±1%; 0,33W	B54413-A9281-F500
R20	1	200 Ohm ±5%; 0,33W	B54413-A2201-J
R21	1	1kOhm ±5%; 0,33W	B54413-A2102-J
R23	1	22kOhm ±5%; 0,25W	B51263-A2223-J
R25	1	2,2kOhm ±5%; 0,25W	B51263-A2222-J
R26,34	2	15kOhm ±5%; 0,25W	B51263-A2153-J
R27,35	2	3kOhm ±5%; 0,25W	B51263-A2302-J
R30,38	2	180 Ohm ±1%; 0,33W	B54413-A9181-F
R31	1	68 Ohm ±5%; 0,33W	B54413-A2680-J
R32,39	2	300 Ohm ±1%; 0,33W	B54413-A9301-F
R33,40	2	1,2kOhm ±5%; 0,25W	B51263-A2122-J
R41,43	2	200 Ohm ±5%; 0,33W	B54413-A2201-J
R42	1	910 Ohm ±5%; 0,33W	B54413-A2911-J
Ü1,2	2	Übertrager TRANSFORMER Rel sp 821	Rel Bv 622 W 3C40
L1	1	Spulentopf COIL CAN C4433C-A3-A1	Rel Bv 623 G 3062
C1..4 C11,13 C14..17 C20,22	12	MKE-Kondensator MKH-CAPACITOR 0,C1/uF ±20%; 250V	B3222C-K3103-M
		Keramik-Kondensator CERAMIC CAPACITOR	
C5	1	7pF ±0,5pF; 500V Wert wie eingebaut VALUE AS MOUNTED	B38226-J5070-D
C7	1	15pF ±5%; 500V	B38226-J5150-J
		Kf-Kondensator PLASTIC-FOIL CAPACITOR	
C8	1	150pF ±2,5%; 500V	B31141-A5151-H
C9	1	1C00pF ±2,5%; 500V	B31141-A5102-H
C12	1	MKL-Kondensator MKL-CAPACITOR C,15/uF ±20%; 63V	B32110-B9154-M
C18	1	MKH-Kondensator MKH-CAPACITOR C,C22/uF ±20%; 250V	B32220-K3223-M
C19,21	2	Kf-Kondensator PLASTIC-FOIL CAPACITOR 1C0pF ±5%; 500V	B31141-A5101-J
C6	1	Lufttrimmer AIR-DIELECTRIC TRIMMER 1,7...19pF	Rel ko 131ca
Gr1,2	2	Germaniumdiode GERMANIUM-DIODE GA 9C	Rel TL 672 R 1C8
Gr3	1	Varaktordiode VARACTOR-DIODE HC 7C04B 7CpF±5%; bei/at -4V/25°C	Rel TL 672 R129 a10
Gr4	1	Zenerdiode ZENER DIODE Z7	Q62702-Z339-P4
	1	Halterung MOUNTING	C42121-A9-A1
Ts1. ..9	9	Transistor TRANSISTOR BCY 58 / VIII	Q6C203-Y58-H
	9	Halterung MOUNTING	C42121-A11-C10

P1.2 Rasteroszillator-Platte 2 S45035-W668-A701
SPECTRUM OSCILLATOR BOARD 2

		Schichtwiderstand LAYER-TYPE RESISTOR	
R1,2	2	2,2kOhm ±5%; 0,25W	B51263-A2222-J
R3	1	300 Ohm ±1%; 0,33W	B54413-A9301-F
R4	1	600 Ohm ±1%; 0,33W	B54413-A9601-F
R5,6,33	3	220 Ohm ±5%; 0,33W	B54413-A2221-J
R7	1	12kOhm ±5%; 0,25W	B51263-A2123-J
R8	1	16kOhm ±5%; 0,25W	B51263-A2163-J
R9	1	2,4kOhm ±5%; 0,25W	B51263-A2242-J
R10	1	1,8kOhm ±5%; 0,25W	B51263-A2182-J
R11	1	200 Ohm ±1%; 0,33W	B54413-A9201-F
R12	1	30kOhm ±5%; 0,25W	B51263-A2303-J
R14	1	3,9kOhm ±1%; 0,1W	B51263-A9392-F
R15,38	2	8,2kOhm ±5%; 0,25W	B51263-A2822-J
R16,34	2	1,2kOhm ±5%; 0,25W	B51263-A2122-J

R17	1	27C Ohm ±5%; 0,33W	B54413-A2271-J
R18	1	15C Ohm ±5%; 0,33W	B54413-A2151-J
R19	1	47kOhm ±5%; 0,25W	B51263-A2473-J
R20,21	2	3,9kOhm ±1%; 0,1W	B51263-A9392-F
R22,26	2	2kOhm ±1%; 0,1W	B51263-A9202-F
R23	1	22kOhm ±1%; 0,1W	B51263-A9223-F
R25,32	2	5,6kOhm ±1%; 0,1W	B51263-A9562-F
R27	1	360 Ohm ±1%; 0,33W	B54413-A9361-F
R28	1	3kOhm ±1%; 0,1W	B51263-A9302-F
R29	1	1kOhm ±1%; 0,33W	B54413-A9102-F
R30	1	30kOhm ±1%; 0,1W	B51263-A9303-F
R35	1	4,7kOhm ±5%; 0,25W	B51263-A2472-J
R36	1	470 Ohm ±5%; 0,33W	B54413-A2471-J
R37	1	56kOhm ±5%; 0,25W	B51263-A2563-J
R39	1	330 Ohm ±5%; 0,33W	B54413-A2331-J
R13	1	Schichtdrehwiderstand LAYER-TYPE VAR RESISTOR 5kOhm ±20%; 1W; lin	W4C955-A6502-MC01
	1	Staubschutzkappe PROTECTION CAP	C44408-Z3-C3
R24,31	2	Thermewid THERM. RESISTOR K11e / 3000°K	Q63011-K501-K
		Übertrager TRANSFORMER	
U1	1	C42035-A1C-A3	V45231-C3137
U2	1	C42C35-A1C-A3	V45231-C3138
		Spule COIL	
L1	1	Rel sp 82i	Rel Bv 622 W 3C41
L2	1	Rel sp 82i	Rel Bv 622 W 3C42
C1,2,7	3	MKH-Kondensator MKH-CAPACITOR 0,022/uF ±20%; 250V	B32220-B3153-K
C3,5,6 C10,2C	5	MKL-Kondensator MKL-CAPACITOR 0,15/uF ±20%; 63V	B32110-B3154-M
C4	1	Kf-Kondensator PLASTIC-FOIL CAPACITOR 6COpF ±5%; 5COV	B31141-A5601-J
		MKL-Kondensator MKL-CAPACITOR	
C8, C16..19	5	1,5/uF ±20%; 63V	B32110-B3155-M
C9	1	0,68/uF ±20%; 63V	B32110-B3684-M
		Kf-Kondensator PLASTIC-FOIL CAPACITOR	
C11	1	2COOpF ±5%; 125V	B31141-A1202-J
C12	1	4240pF ±1%; 125V	B31142-A1422-F4CC
C13	1	1190pF ±1%; 125V	B31141-A1112-F5C0
C14	1	9540pF ±1%; 125V	B31142-A1952-F4C0
C15	1	53COpF ±1%; 125V	B31142-A1532-F
C21	1	MKL-Kondensator MKL-CAPACITOR 0,47/uF ±20%; 63V	B32110-B9474-M
		Germaniumdiode GERMANIUM DIODE	
Gr1,2	2	GA 159	Q62701-A49-F2
Gr3,4	2	GA 90	Rel TL 672 R 108
Ta1 ..9	9	Transistor TRANSISTOR BCY 58 / VIII	Q60203-Y58-H
	9	Halterung MOUNTING	C42121-A11-C10

P1.3 Rasteroszillator-Platte 3 S45C35-W669-A701
SPECTRUM OSCILLATOR BOARD 3

		Schichtwiderstand LAYER-TYPE RESISTOR	
R1	1	3C0 Ohm ±5%; 0,33W	B54413-A2301-J
R2,12	2	15kOhm ±5%; 0,25W	B51263-A2153-J
R3,6	2	4,7kOhm ±5%; 0,25W	B51263-A2472-J
R4	1	10 Ohm ±5%; 0,33W	B54413-A2100-J
R5,32	2	22kOhm ±5%; 0,25W	B51263-A2223-J
R7,30	2	2,2kOhm ±5%; 0,25W	B51263-A2222-J
R8	1	2,2kOhm ±1%; 0,1W	B51263-A9222-F
R9	1	220 Ohm ±1%; 0,33W	B54413-A9221-F
R10	1	5,6kOhm ±1%; 0,25W	B51263-A2562-F
R11	1	820 Ohm ±5%; 0,33W	B54413-A2821-J
R13	1	50kOhm ±1%; 0,1W	B51263-A9503-F
R14	1	3,9kOhm ±5%; 0,25W	B51263-A2392-J
R15	1	1,5kOhm ±5%; 0,25W	B51263-A2152-J
R16	1	6,2kOhm ±5%; 0,2W	B51362-A2622-J
R17	1	75kOhm ±5%; 0,25W	B51263-A2753-J
R18	1	56 Ohm ±5%; 0,33W	B54413-A2560-J
R19	1	200 Ohm ±1%; 0,33W	B54413-A9201-F
R20	1	120 Ohm ±1%; 0,33W Wert wie eingebaut VALUE AS MOUNTED	B54413-A9121-F
R21	1	30kOhm ±5%; 0,25W	B51263-A2303-J
R22	1	6,8kOhm ±5%; 0,25W	B51263-A2682-J
R23	1	56kOhm ±1%; 0,1W	B51263-A9563-F
R24	1	560 Ohm ±1%; 0,33W	B54413-A9561-F
R25	1	18kOhm ±5%; 0,25W	B51263-A2183-J
R26,34	2	1,2kOhm ±1%; 0,1W	B51263-A9122-F
R27	1	2,7kOhm ±1%; 0,1W	B51263-A9272-F
R28	1	1,8kOhm ±5%; 0,25W	B51263-A2182-J
R29	1	390 Ohm ±1%; 0,33W	B54413-A9391-F
R31	1	150 Ohm ±5%; 0,33W	B54413-A2151-J
R33	1	12kOhm ±5%; 0,25W	B51263-A2123-J
R35,36	2	12kOhm ±1%; 0,1W	B51263-A9123-F
R37	1	100 Ohm ±5%; 0,33W	B54413-A2101-J
R38	1	1,8kOhm ±1%; 0,1W	B51263-A9182-F
R39	1	220 Ohm ±5%; 0,33W	B54413-A2221-J
R40	1	Thermewid THERM. RESISTOR 20kOhm ±5%; 3250°K	Q63011-K2C3-K
		Übertrager TRANSFORMER	
U1	1	C42035-A1C-A3	V45231-C3139
U2	1	Rel sp 82i	Rel Bv 622 W 3C39
		Spule COIL	
L1	1	Rel sp 82i	Rel Bv 622 W 3C43
L2	1	Rel sp 82i	Rel Bv 622 W 3C44
		Kf-Kondensator PLASTIC-FOIL CAPACITOR	
C2	1	80pF ±5%; 5C0V	B31141-A58C0-J
C3	1	500pF ±1%; 500V	B31141-A55C1-F
C4,5,6 C8,11,21 C23,25	8	MKL-Kondensator MKL-CAPACITOR 0,15/uF ±20%; 63V	B32110-B9154-M
C9	1	Kf-Kondensator PLASTIC-FOIL CAPACITOR 60pF ±5%; 500V	B31141-A560C-J
C9	1	Keramik-Kondensator CERAMIC CAPACITOR 22pF ±5%; 5C0V	B38222-J5220-J
C10	1	Kf-Kondensator PLASTIC-FOIL CAPACITOR 2500pF ±1%; 125V	B31141-A1252-F
C12	1	Tantal-Elko TANTALUM ELECTROLYTIC CAPACITOR 22/uF ±20%; 15V	B4517.-A2226-M
C13,18 C19,20	4	MKH-Kondensator MKH-CAPACITOR 0,01/uF ±20%; 250V	B32220-K3103-M
C14	1	Keramik-Kondensator CERAMIC CAPACITOR 60pF ±2%; 500V	B38221-J5600-G
		Keramik-Kondensator CERAMIC CAPACITOR	
C16	1	20pF ±2,5%; 500V	B38221-J5200-H
C17	1	32pF ±2%; 5C0V	B38221-J5320-G
C22	1	Kf-Kondensator PLASTIC-FOIL CAPACITOR 1320pF ±1%; 125V	B31141-A1132-F200
C24	1	MKL-Kondensator MKL-CAPACITOR 0,22/uF ±20%; 63V	B32110-B9224-M

		Lufttrimmer AIR-DIELECTRIC TRIMMER	
C1	1	2...31 pF	Rel ko 130cb
C15	1	2,5...11 pF	Rel ko 131f
Kr1	1	Steuer-Quarz CONTROL-CRYSTAL Q34; f = 100 kHz	Q83404-A1000-G
	1	Halterung/MOUNTING	C42121-A25-A2
Kr2	1	Filter-Quarz FILTER-CRYSTAL Q31; f = 2,33975 MHz	Q83124-C2339-H750
	1	Halterung/MOUNTING	C42121-A25-A1
Gr1,2	2	Germanium-Diode GERMANIUM DIODE OA 90	Rel TL 672 R 108
Gr3	1	Zener-Diode ZENER DIODE BZ 7 KB	Q62604-K7-B
Gr4	1	Germanium-Diode GERMANIUM DIODE AAY 26	Q60101-Y26
Gr5	1	Silizium-Diode SILICON DIODE BAY 30	Q60201-Y30
	2	Halterung für Gr3, 5 MOUNTING FOR Gr3, 5	C42121-A9-A1
		Transistor TRANSISTOR	
Ts1,2 Ts6..10	7	BCY 58 / VIII	Q60203-Y58-E
Ts3,4	2	2 N 2218	Q62702-S0002
Ts5	1	MM 1614	Q62702-S55-P6
		Halterung MOUNTING	
	7	für Ts1,2,6..10 FOR Ts1,2,6..10	C42121-A11-C10
	3	für Ts3..5 FOR Ts3..5	C42121-A11-C6
	5	Isolierperle BEAD	C42187-Z7-C2
		Verdrahtungsleiterplatte S45C35-W570-A701 PRINTED CIRCUIT BOARD	
C1	1	Tantal-Elko TANTALUM ELECTROLYTIC CAPACITOR 4,7/uF +20%; 20V	B45170-A3475-M
L1	1	Drossel REACTOR 70/uH/0,2A	B82501-A-C18
	8	Lötstift SOLDERING PIN	C22195-Z11-C1

Oszillator II 0...10 kHz S45034-W231-A702
OSCILLATOR II 0...1 kHz

Verwendung: Pegelsender S45034-W231-B302, B602
USED IN: LEVEL OSCILLATOR S45034-W231-B302, B602

Symbol SYBOL	Stck QTY	Gegenstand DESCRIPTION	Bestellangabe ORDERING DATA	Seite PAGE
P1.1	1	Interpolator-Platte 1 INTERPOLATOR BOARD 1	S45035-W671-A701	
P1.2	1	Interpolator-Platte 2 INTERPOLATOR BOARD 2	S45035-W672-A701	
P1.3	1	Interpolator-Platte 3 INTERPOLATOR BOARD 3	S45035-W673-A701	
	1	Verdrahtungs-leiterplatte PRINTED CIRCUIT BOARD	S45035-W674-A701	
R1	1	Schichtwiderstand LAYER-TYPE RESISTOR 600 Ohm ±1%; 0,35W	B54413-A9601-F	
C2	1	Lufttrimmer AIR-DIELECTRIC TRIMMER 1,3...5pF	Rel ko 131ac	
C3	1	Keramik-Kondensator CERAMIC CAPACITOR 5pF ±0,5pF; 500V	B38212-A5060-D003	
K2	1	Drehko VAR. CAPACITOR 10/170pF C001 ZZ168 (Fa.Valvo)	Rel TL 632 B 3002a1	
Sz2	1	Allsichtschauzeichen INDICATOR hi'grün/orange br'green/orange	v45282-Z3009-A1	
S7	1	Kleindrehschalter MIDGET ROTARY SWITCH	C40315-M303-N1	
	1	Kurbel-Drehknopf ROTARY KNOB FOR CRANK 37 ø	C44106-A20-A2	
	1	Drehknopf ROTARY KNOB	C44106-A20-A3	
	1	Kniekelgriff KNOB	Rel antr 93c	
Ü1	1	Übertrager TRANSFORMER	V45231-P3082	
BuB Bu10	2	Gerätebuchse gerade COAX JACK 1,6/5,6	C42334-A76-A14	
BuC	1	Schaltbuchse SWITCHING JACK 1,6/5,6; (1a, 1r)	C42334-A76-A34	
	1	Filmskalenantrieb FILM-SCALE DRIVE 1m grob/fein 1m COARSE/FINE	C44106-A7-A4	
	1	Membrankupplung MEMBRANE DRIVE COUPLING	C44106-A5-A61	

P1.1 Interpolator-Platte 1 S45035-W671-A701
INTERPOLATOR BOARD 1

		Schichtwiderstand LAYER-TYPE RESISTOR	
R1,12,21	3	150 Ohm ±5%; 0,33W	B54413-A2151-J
R2,26	2	2,7kOhm ±5%; 0,25W	B51263-A2272-J
R3	1	2,7kOhm ±1%; 0,1W	B51263-A9272-F
R4	1	1kOhm ±1%; 0,33W	B54413-A9102-F
R5	1	27kOhm ±5%; 0,25W	B51263-A2273-J
R6	1	8,2kOhm ±1%; 0,1W	B51263-A9822-F
R7	1	5,6kOhm ±1%; 0,1W	B51263-A9562-F
R8,25,28	3	6,8kOhm ±5%; 0,25W	B51263-A2682-J
R9,13,29	3	18kOhm ±5%; 0,25W	B51263-A2183-J
R10,30	2	330 Ohm ±5%; 0,33W	B54413-A2331-J
R11,31	2	1,8kOhm ±5%; 0,25W	B51263-A2182-J
R14	1	4,3kOhm ±5%; 0,25W	B51263-A2432-J
R15	1	4,7kOhm ±1%; 0,1W	B51263-A9472-F
R16	1	200 Ohm ±1%; 0,33W	B54413-A9201-F
R17	1	1kOhm ±5%; 0,33W	B54413-A2102-J
R18	1	2,2kOhm ±5%; 0,25W	B51263-A2222-J
R19	1	100 Ohm ±5%; 0,33W	B54413-A2101-J
R20	1	10 Ohm ±5%; 0,33W	B54413-A2100-J
R22	1	100 Ohm ±1%; 0,33W	B54413-A9101-F
R23	1	560 Ohm ±5%; 0,33W	B54413-A2561-J
R24	1	470 Ohm ±5%; 0,33W	B54413-A2471-J
R27	1	820 Ohm ±5%; 0,33W	B54413-A2821-J
		Übertrager TRANSFORMER	
Ü1	1	Rel sp 821	Rel Bv 622 W 3032
Ü2	1	9 Rel sp 6h	Rel Bv 622 P 3417
		MKL-Kondensator MKL-CAPACITOR	
C1	1	0,68 µF ±20%; 63V	B32110-E9684-M
C2..5 C7,9, C15,17	8	0,15 µF ±20%; 63V	B32110-E9154-M
C6,8,14	3	0,33 µF ±20%; 63V	B32110-E9334-M
		Keramik-Kondensator CERAMIC CAPACITOR	
C11	1	90pF ±1%; 500V	B38241-J5900-P003
C12	1	15pF ±5%; 500V Wert wie eingebaut/VALUE AS MOUNTED	B38246-J5150-J003
C13,16	2	MKL-Kondensator MKL-CAPACITOR 1,5 µF ±20%; 63V	B32110-E9155-M
C10	1	Lufttrimmer AIR-DIELECTRIC TRIMMER 2...31pF	Rel ko 130cb
Gr1	1	Diode DIODE OA 159	Q62701-A49-F2
Gr2	1	Zenerdiode ZENER DIODE Z7	Q62702-Z339-F4
	1	Halterung MOUNTING	C42121-A9-A1
Ts1 ..7	7	Transistor TRANSISTOR BCY 55 / VIII	Q60203-Y58-H
	7	Halterung MOUNTING	C42121-A11-C10

P1.2 Interpolator-Platte 2 S45035-W672-A701
INTERPOLATOR BOARD 2

		Schichtwiderstand LAYER-TYPE RESISTOR	
R1,7	2	33kOhm ±5%; 0,25W	B51263-A2333-J
R2	1	5,1kOhm ±5%; 0,25W	B51263-A2512-J
R3	1	2,7kOhm ±5%; 0,25W	B51263-A2272-J
R4	1	330 Ohm ±1%; 0,33W	B54413-A9331-F
R5,13	2	8,2kOhm ±1%; 0,1W	B51263-A9822-F
R6	1	270 Ohm ±5%; 0,33W	B54413-A2271-J
R8	1	5,6kOhm ±5%; 0,25W	B51263-A2562-J
R10,11,14	3	5,6kOhm ±1%; 0,1W	B51263-A9562-F
R12	1	2,5kOhm ±1%; 0,1W	B51263-A9252-F
R15	1	3,9kOhm ±5%; 0,25W	B51263-A2392-J
R16,18	2	8,2kOhm ±5%; 0,25W	B51263-A2822-J
R17	1	1kOhm ±5%; 0,33W	B54413-A2102-J
R19	1	1,5kOhm ±5%; 0,25W	B51263-A2152-J
R20,27	2	820 Ohm ±5%; 0,33W	B54413-A2821-J
R21,23	2	3kOhm ±1%; 0,1W	B51263-A9302-F
R22	1	1kOhm ±1%; 0,33W	B54413-A9102-F
R24	1	620 Ohm ±1%; 0,33W	B54413-A9621-F
R25	1	27kOhm ±1%; 0,1W	B51263-A9273-F
R26	1	9,1kOhm ±5%; 0,25W	B51263-A2912-J
R28	1	680 Ohm ±1%; 0,33W	B54413-A9681-F
		Thermowid THERM. RESISTOR	
R30	1	200 Ohm ±5%; 3000°K	Q63011-K201-J
R31	1	1kOhm ±5%; 3240°K	Q63011-K102-J
Ü1	1	Übertrager TRANSFORMER	Rel Bv 622 W 3033
L1,2	2	Spule COIL	Rel Bv 622 W 3034

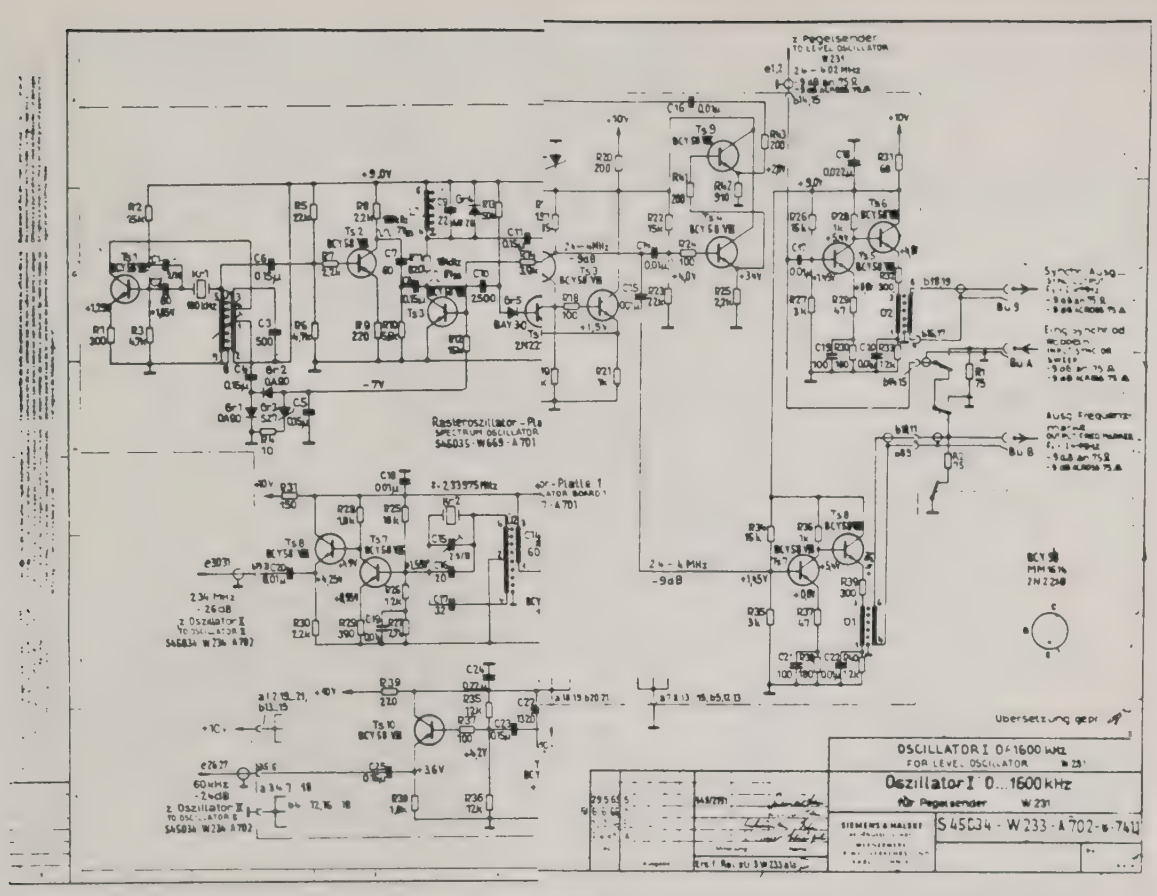
C1	1	Kf- Kondensator PLASTIC-FOIL CAPACITOR 2000pF ±5%; 125V	B31141-A1202-J
		MKL-Kondensator MKL-CAPACITOR	
C2	1	0,47/uF ±20%; 63V	B32110-E9474-M
C3,6	2	0,1/uF ±20%; 100V	B32110-D0104-M
C4	1	Keramik-Kondensator CERAMIC CAPACITOR 8pF ±0,5pF; 500V	B38211-J5080-D
C5	1	MKH-Kondensator MKH-CAPACITOR 0,047/uF ±20%; 250V	B32220-K3473-M
C7	1	MKL-Kondensator MKL-CAPACITOR 2,2/uF ±20%; 63V	B32110-E9225-M
		Kf-Kondensator PLASTIC-FOIL CAPACITOR	
C8,10	2	5000pF ±5%; 125V	B31142-A1502-J
C9	1	10000pF ±5%; 125V	B31142-A1103-J
		MKL-Kondensator MKL-CAPACITOR	
C11,12 C15,16	4	4,7/uF ±20%; 63V	B32110-E9475-M
C13	1	0,68/uF ±20%; 63V	B32110-E9684-M
C14	1	0,22/uF ±20%; 63V	B32110-E9224-M
C17	1	Kf-Kondensator PLASTIC-FOIL CAPACITOR 100pF ±5%; 500V	B31141-A5101-J
Gr1 ..4	4	Diode DIODE OA 90	Rel TL 672 R 108
		Transistor TRANSISTOR	
Ts1..3 Ts5,6	5	BCY 58 / VIII	Q60203-Y58-H
Ts4	1	2 N 3250	Q62702-P76
	6	Halterung MOUNTING	C42121-A11-C10
	2	Isolierperle BEAD	C42187-Z7-C2

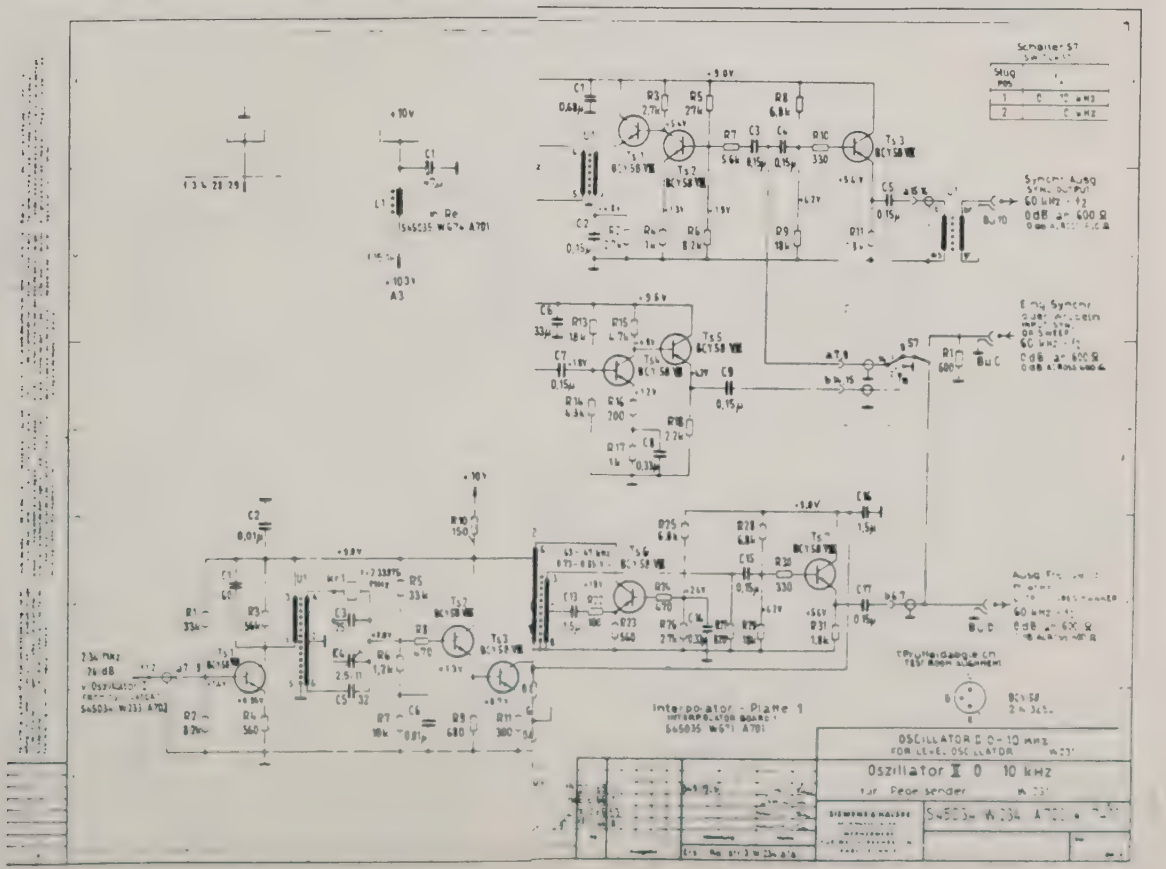
P1.3 Interpolator-Platte 3 S45035-W673-A701
INTERPOLATOR BOARD 3

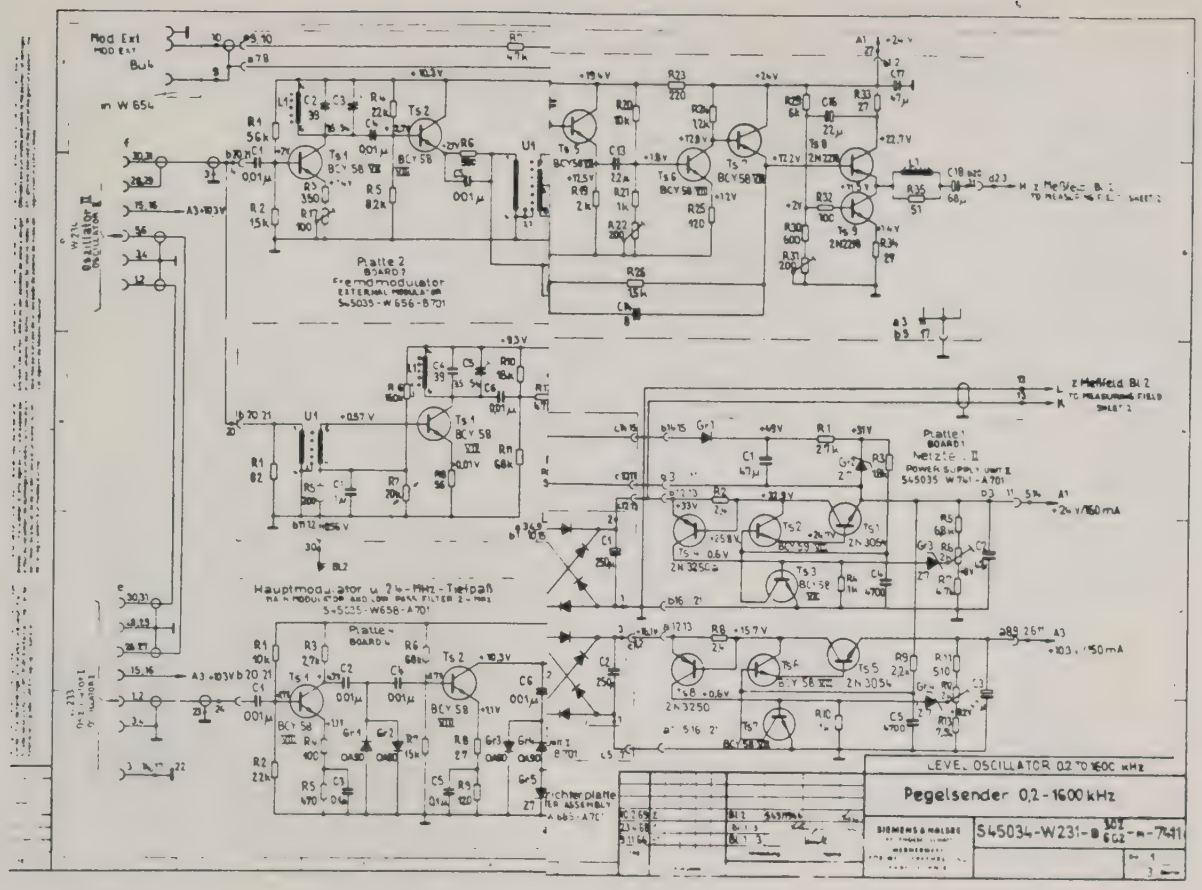
		Schichtwiderstand LAYER-TYPE RESISTOR	
R1,5	2	33kOhm ±5%; 0,25W	B51263-A2333-J
R2	1	6,2kOhm ±5%; 0,25W	B51263-A2822-J
R3	1	56kOhm±1%; 0,1W	B51263-A9563-F
R4,25	2	560 Ohm ±1%; 0,33W	B54413-A9561-F
R6	1	1,2kOhm ±1%; 0,1W	B51263-A9122-F
R7	1	10kOhm ±5%; 0,25W	B51263-A2103-J
R8,18 R20,37	4	470 Ohm ±5%; 0,33W	B54413-A2471-J
R9	1	680 Ohm ±5%; 0,33W	B54413-A2681-J
R10,23 R34	3	150 Ohm ±5%; 0,33W	B54413-A2151-J
R11	1	300 Ohm ±1%; 0,33W	B54413-A9301-F
R12	1	390 Ohm ±5%; 0,33W	B54413-A2391-J
R13..16, R28	5	150 Ohm ±1%; 0,33W	B54413-A9151-F
R17	1	1,2kOhm ±5%; 0,25W	B51263-A2122-J
R19	1	3,9kOhm ±5%; 0,25W	B51263-A2392-J
R21	1	20kOhm ±5%; 0,25W	B51263-A2203-J
R22	1	27kOhm ±5%; 0,25W	B51263-A2273-J
R24	1	2,7kOhm ±1%; 0,1W	B51263-A9272-F
R26	1	30kOhm ±5%; 0,25W	B51263-A2303-J
R27	1	15kOhm ±5%; 0,25W	B51263-A2153-J
R29	1	220 Ohm ±5%; 0,33W	B54413-A2221-J
R30	1	68kOhm ±5%; 0,25W	B51263-A2683-J
R31	1	15kOhm ±1%; 0,1W	B51263-A9153-F
R32	1	27kOhm ±1%; 0,1W	B51263-A9273-F
R33	1	560 Ohm ±5%; 0,33W	B54413-A2561-J
R35	1	56kOhm ±5%; 0,25W	B51263-A2563-J
R36	1	2,2kOhm ±5%; 0,25W	B51263-A2222-J
Ü1	1	Übertrager TRANSFORMER Rel ep 821	Rel Bv 622 W 3035
		Übertrager TRANSFORMER	
Ü2	1	Rel ep 821	Rel bv 622 W3036
Ü3	1	Rel ep 821	Rel Bv 622 W3037
Ü4	1	Rel ep 821	Rel Bv 622 W3038
Ü5	1	9 Rel ep 6h	Rel Bv 622 P3418
C1	1	Keramik-Kondensator CERAMIC CAPACITOR 60pF ±5%; 500V	B38221-J5600-J
C2,6,8,9 C11..13 C15..17 C19,23	12	MKH-Kondensator MKH-CAPACITOR 0,01/uF ±20%; 250V	B32220-K3103-M
		Keramik-Kondensator CERAMIC CAPACITOR	
C3	1	25pF ±2%; 500V	B38221-J5250-C
C5	1	32pF ±2%; 500V	B38221-J5320-C
		Kf-Kondensator PLASTIC-FOIL CAPACITOR	
C7	1	102pF ±1%; 500V	B31141-A5101-F200
C10	1	1000pF ±5%; 500V	B31141-A5102-J
C14	1	425pF ±1%; 500V	B31141-A5421-F500
C18	1	MKL-Kondensator MKL-CAPACITOR 0,1/uF ±20%; 100V	B32110-D0104-M
		Keramik-Kondensator CERAMIC CAPACITOR	
C20	1	80pF ±2%; 500V	B38221-J5800-C
C22	1	36pF ±2%; 500V	B38222-J5360-C
		Lufttrimmer AIR-DIELECTRIC TRIMMER	
C4	1	2,5...11 pF	Rel ko 131f
C21	1	1,7...19 pF	Rel ko 130ca
K1	1	Filter-Quarz FILTER-CRYSTAL Q31; f=2,33975 MHz	Q83124-C2339-H750
	1	Halterung MOUNTING	C42121-A25-A1
Gr1,2	2	Diode DIODE OA 90	Rel TL 672 R 108
Gr3	1	Zener-Diode ZENER DIODE Z7	Q62702-Z339-F4
	1	halterung MOUNTING	C42121-A9-A1
Gr4	1	Diode DIODE OA 159	Q62701-A49-F2
Gr5,6	2	Varaktordiode VARACTOR DIODE 70pF ±5%; bei/AT -4V/25°C HC 70048 (Fa.Hughes)	Rel TL 672 R 129a10
Md1	1	Richtleiterquartett DIODE QUARTET 4xOA 90	V42292-E4-A1
Ts1 ..8	8	Transistor TRANSISTOR BCY 58 / VIII	Q60203-Y58-H
	8	Halterung MOUNTING	C42121-A11-C10

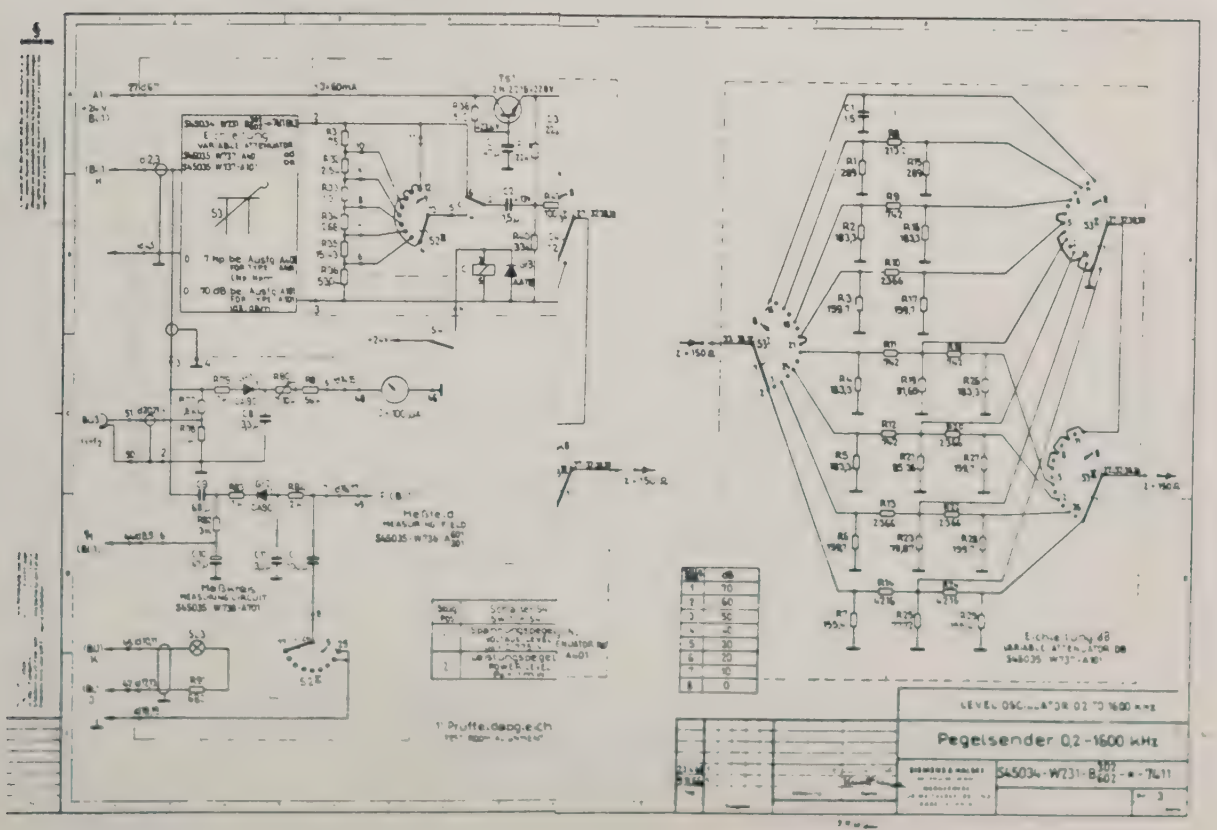
Verdrahtungsleiterplatte S45035-W674-A701
PRINTED CIRCUIT BOARD

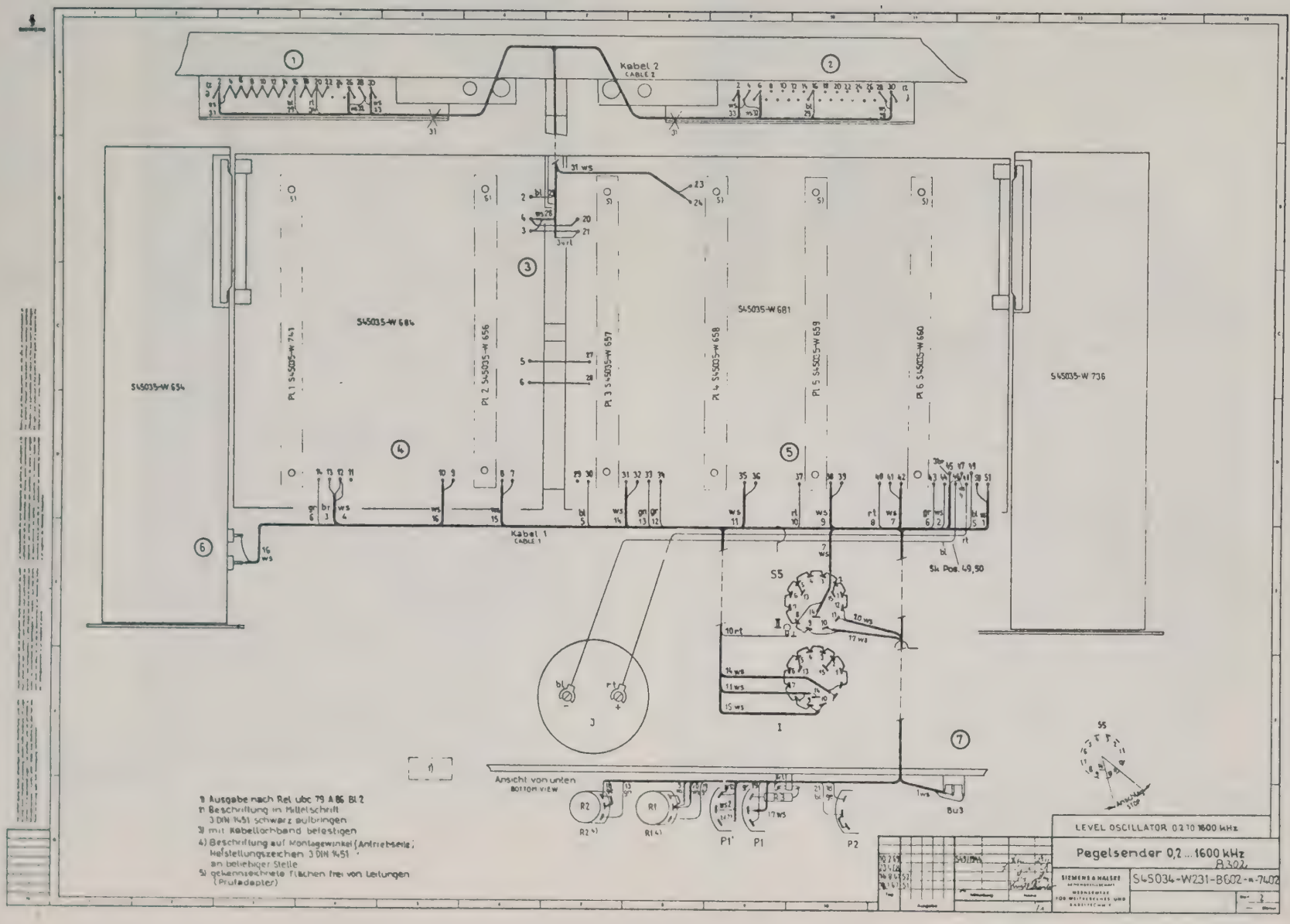
C1	1	Tantal-Elko TANTALUM ELECTROLYTIC CAPACITOR 4,7/uF ±20%; 20V	B45170-A3475-M
L1	1	Drossel REACTOR 70/uH/0,2A	B82501-A-C18
	7	Lötstift SOLDERING PIN	C22195-Z11-C1


OSCILLATOR I 0...1600 kHz
FOR LEVEL OSCILLATOR W 231
Oszillator I 0...1600 kHz
für Pegelsender W 231
S45034 - W233 - A702 - B - 7411
Übersetzung gepr.

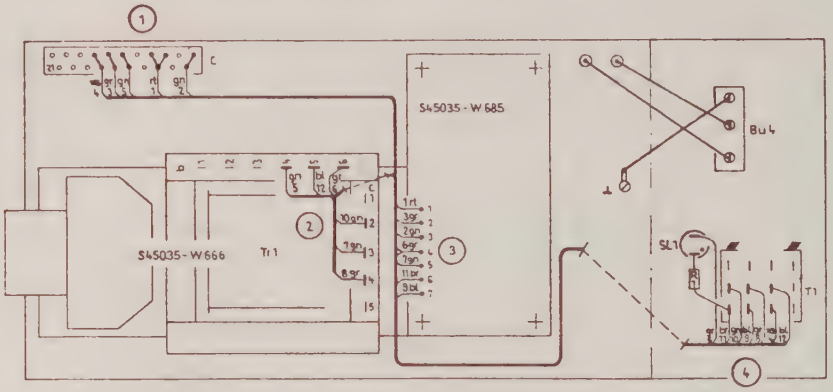

OSCILLATOR II 0 - 10 MHz
FOR LEVEL OSCILLATOR W 231
Oszillator II 0 10 kHz
für Pegelsender W 231
S45034 - W234 - A702
Interpolator - Plane 1
S45035 W671 A701


Platte 2
BOARD 2
Fremdmodulator
EXTERNAL MODULATOR
S-5035-W656-B701
Hauptmodulator u. 2 b-MHz-Tiefpaß
MAIN MODULATOR AND 2 MHz LOW PASS FILTER
S-5035-W656-A701
Platte 1
BOARD 1
Netzteil II
POWER SUPPLY UNIT II
S45035-W701-A701
+24 V/150 mA
+103 V/50 mA
LEVEL OSCILLATOR 0,2 TO 1600 kHz
Pegelsender 0,2-1600 kHz
SIEMENS & HALSKE
S45034-W231-B 102 602 - a - 7411


LEVEL OSCILLATOR 0,2 TO 1600 kHz
Pegelsender 0,2-1600 kHz
SIEMENS & HALSKE
S45034-W231-B 102 602 - a - 7411



1) Ausgabe nach Rel. übc 79 A 85 Bl 2
2) Beschriftung in Mittelschrift 3 DIN 9451 schwarz aufbringen
3) mit Kabelschellband befestigen
4) Beschriftung auf Montagewinkel (Antriebsseite); Helfstellungszeichen 3 DIN 9451 an beliebiger Stelle
5) gekennzeichnete Flächen frei von Leitungen (Prüfadapter)



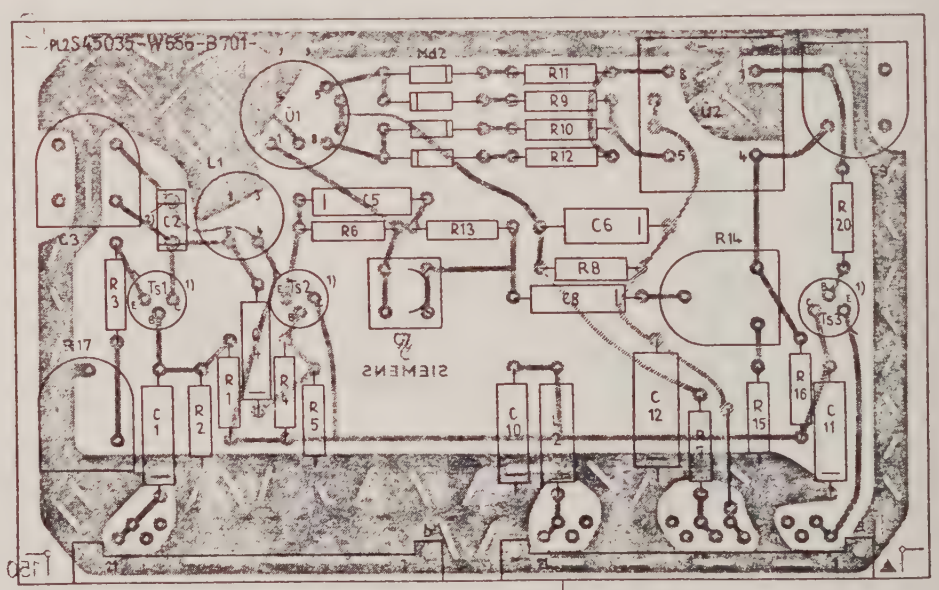
1) Beschriftung in Mittelschrift 3 DIN 1451 schwarz aufbringen

2) Ausgabe nach Rel. ubc 79 A 86, Bl. 2
Herstellungszeichen 3 DIN 1451 an beliebiger Stelle

POWER SUPPLY UNIT I

Netzteil I
für W 231

SIEMENS & HALSKE — S45035-W654-B701-*-7402



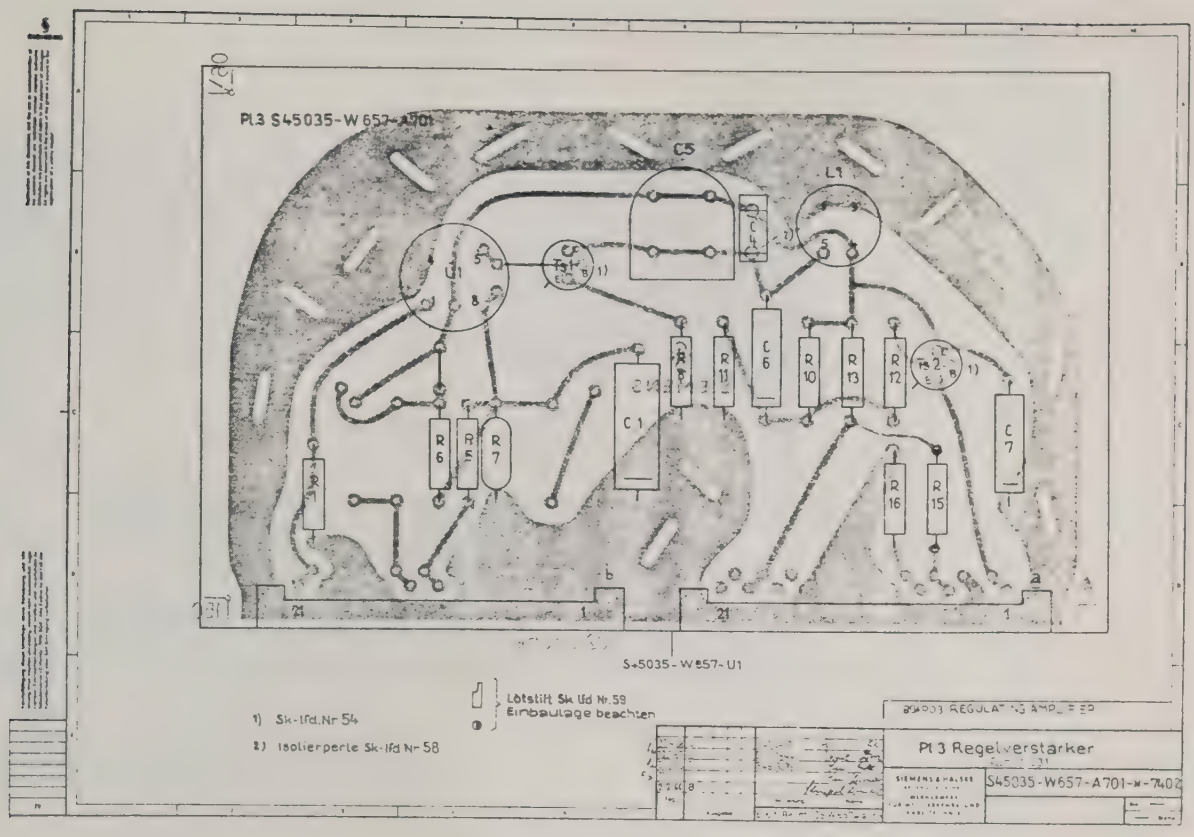
1) Sk-lfd Nr. 57

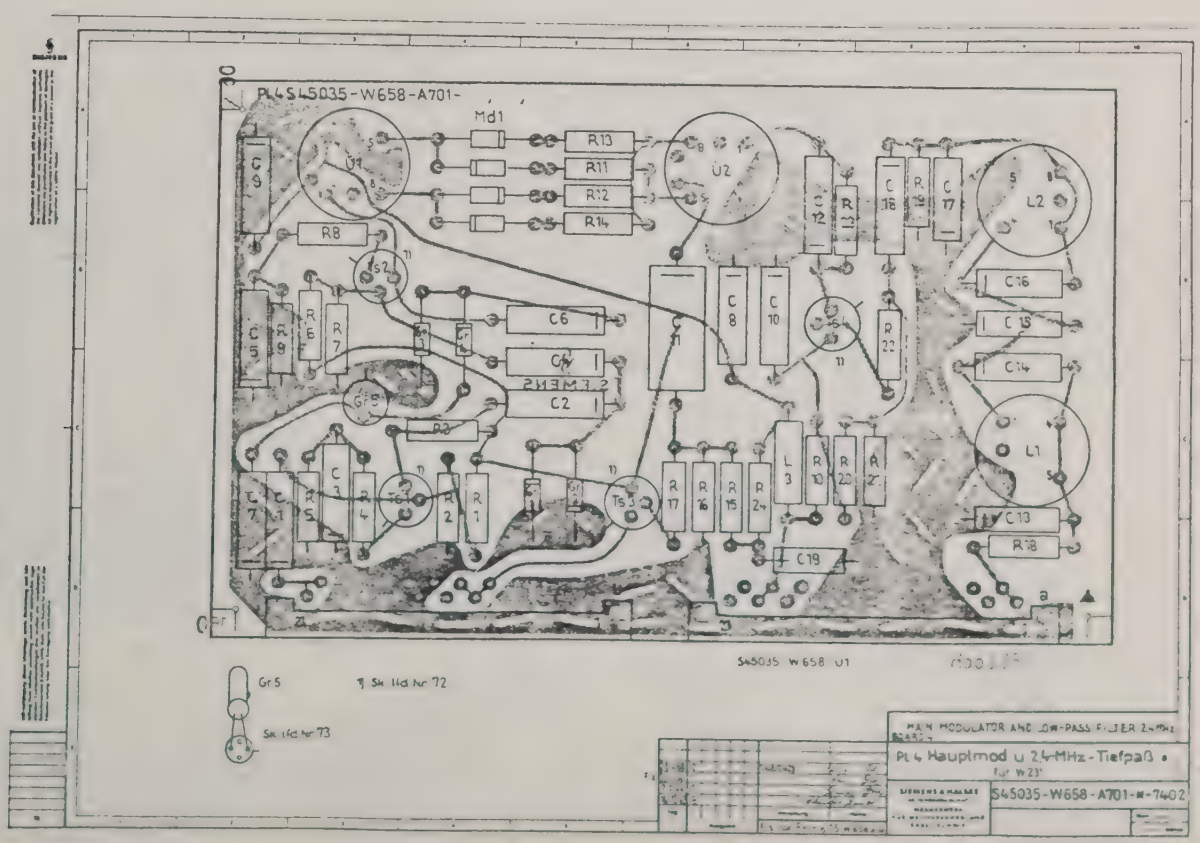
2) Isolierperle Sk-lfd. Nr. 61

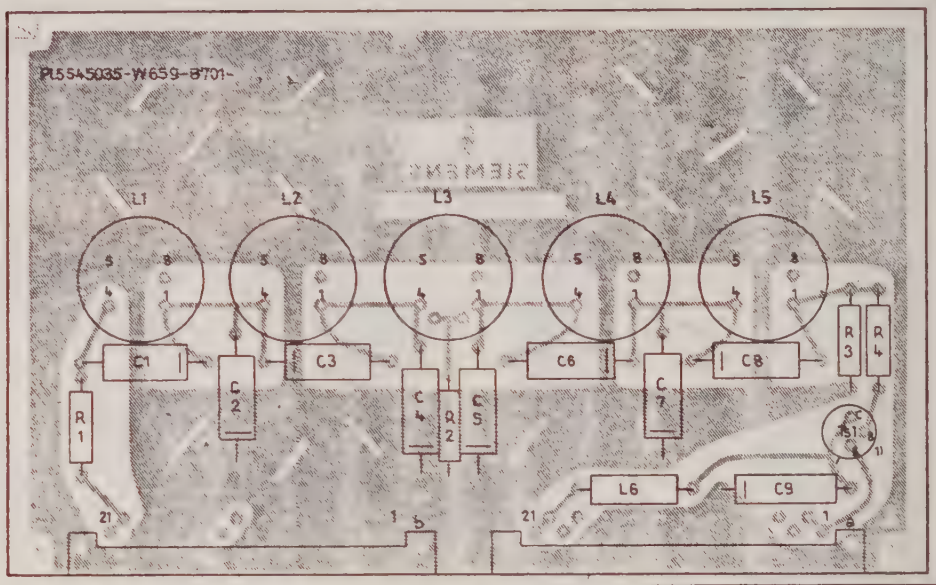
BOARD 2 EXTERNAL MODULATOR

PL2 Fremdmodulator
für W 231

SIEMENS & HALSKE — S45035-W656-B701-*-7402


Pl.3 S45035-W657-A701
C5
L1
C4
U1
Ts1
1)
C6
R9
R11
R10
R13
R12
Ts2
1)
C1
R6
R5
R7
C7
R16
R15
S45035-W657-U1
Lötstift Sk lfd Nr.59
Einbaulage beachten
1) Sk-lfd.Nr 54
2) Isolierperle Sk-lfd Nr 58
Pl 3 Regelverstärker
S45035-W657-A701-W-7402


Pl.4 S45035-W658-A701-
Md1
U1
U2
R13
R11
R12
R14
R8
C9
C6
C4
C2
C5
R9
R6
R7
C8
C10
C12
R22
C16
C15
C14
L2
L1
C13
R18
C19
R17
R16
R15
R24
L3
R10
R20
R21
Ts1
Ts2
Gr5
1) Sk lfd Nr 72
Sk lfd Nr 73
S45035 W658 U1
Pl 4 Hauptmod u 2,4-MHz-Tiefpaß
S45035-W658-A701-W-7402

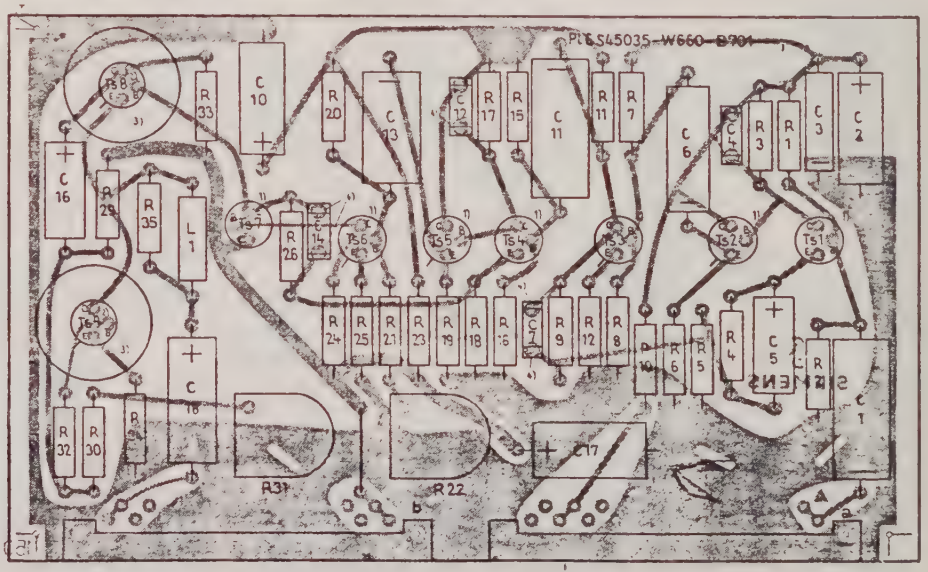


S45035-W659-U1 BOARD 5 1.6-MHz-LOW-PASS FILTER

1) Sk-Lfd Nr 47

PL 5 1,6-MHz-Tiefpaß
für W 231

SIEMENS & HALSKE S45035-W659-B701-A-7402



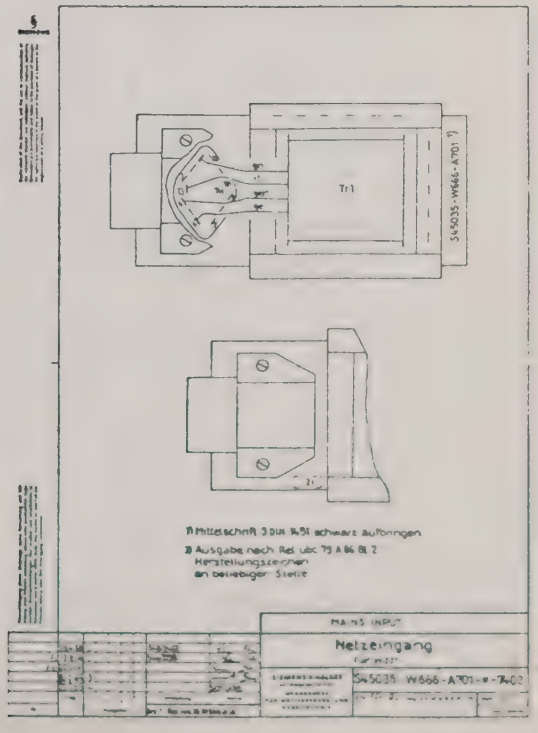
S45035-W660-U1

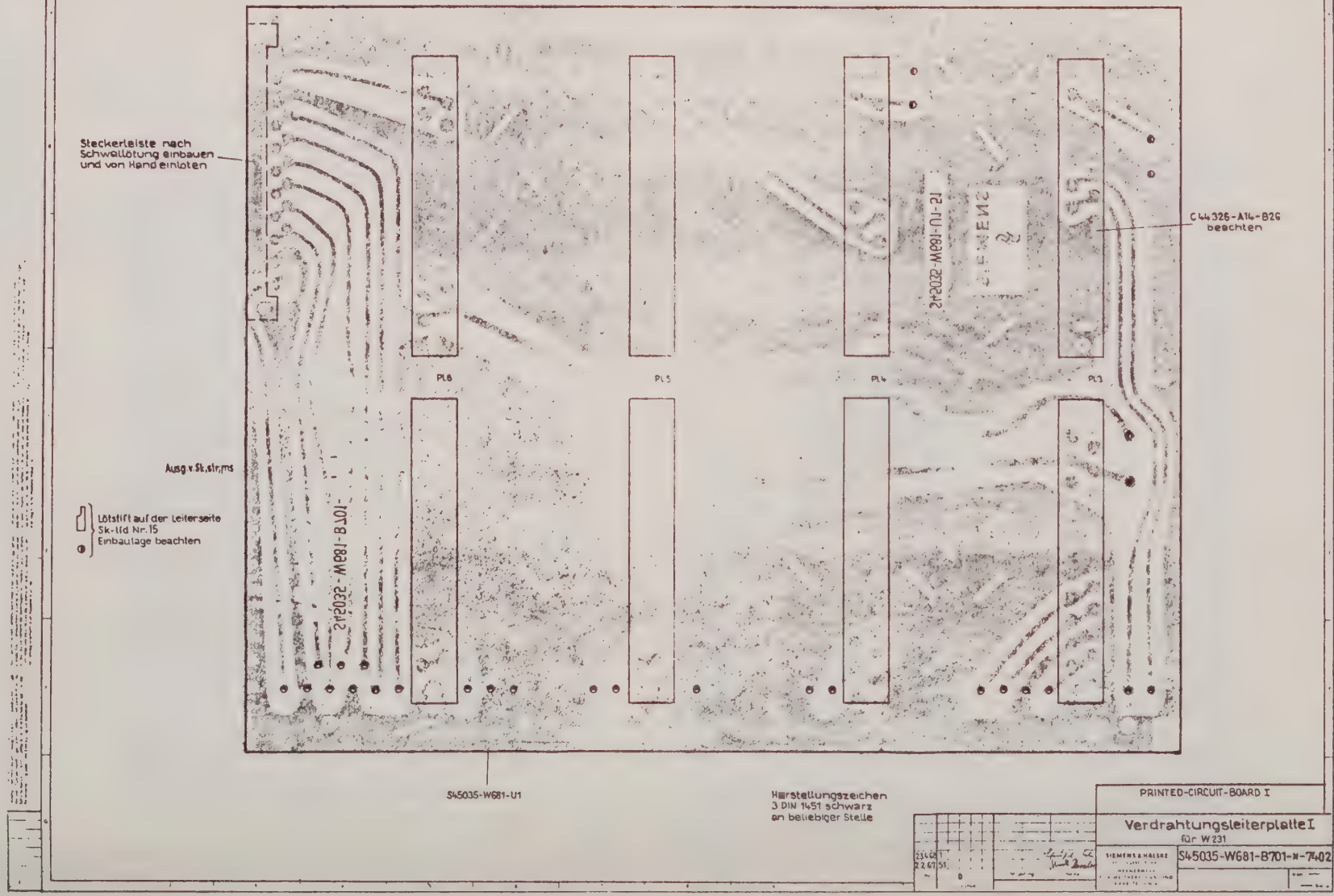
1) Sk-Lfd. Nr. 83
2) Sk-Lfd Nr. 84
3) Sk-Lfd Nr. 85
4) Sk-Lfd Nr. 89

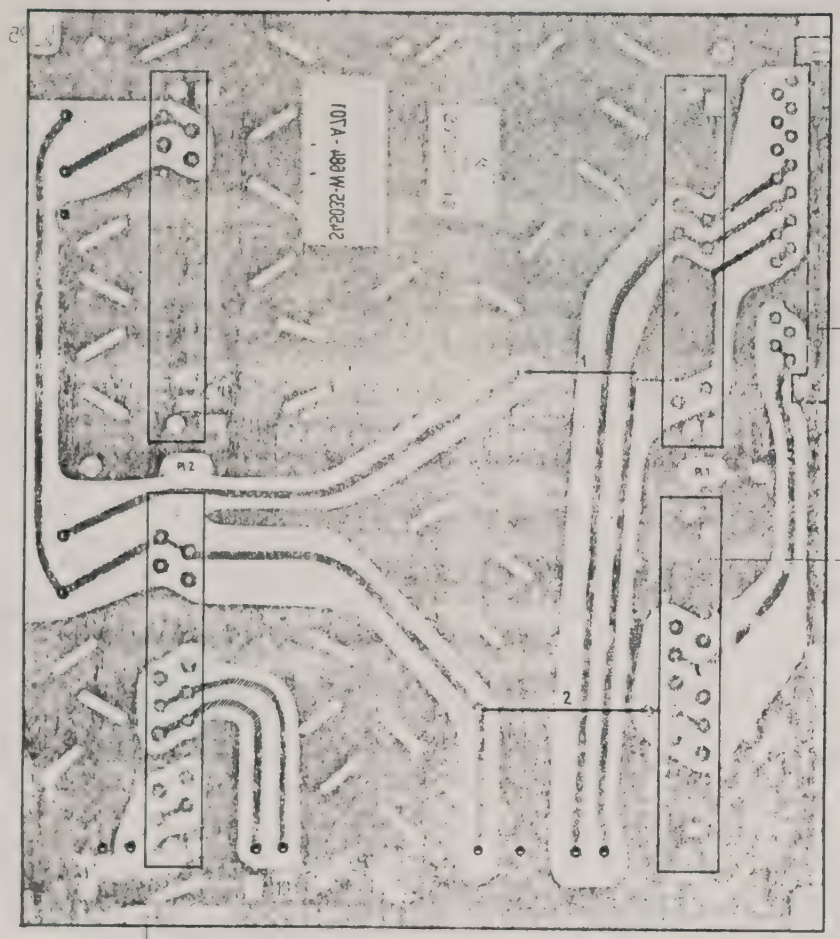
AMPLIFIER

PL6 Verstärker
für W 231

SIEMENS & HALSKE S45035-W660-B701-A-7402


Tr1
S45035-W666-A701-1)
1) Maßstab DIN 5491 schwarz auftönen
2) Ausgabe nach Rel ubc 79 A 86 Bl 2
Herstellungszeichen
an bezeichneter Stelle
MAINS INPUT
Netzeingang
S45035 W666-A701-#-7402


Steckerleiste nach Schwallötung einbauen und von Hand einloten
C44326-A14-B26 beachten
PL6
PL5
PL4
PL3
Ausg.v.Sk.str/ms
Lötstift auf der Leiterseite Sk-Ltd Nr.15 Einbaulage beachten
S45035-W681-U1
Herstellungszeichen 3 DIN 1451 schwarz an beliebiger Stelle
PRINTED-CIRCUIT-BOARD I
Verdrahtungsleiterplatte I
für W 231
S45035-W681-B701-H-7402



Steckerleiste nach der Schwallötung einbauen und von Hand einlöten

C 44326 - A14 - B27 beachten

Lotstift auf der Leiterseite Sk lfd Nr 15 Einbaulage beachten nach der Schwallötung einbauen und von Hand einlöten

1,2 Drahtbrücken

S45035-W684-U1

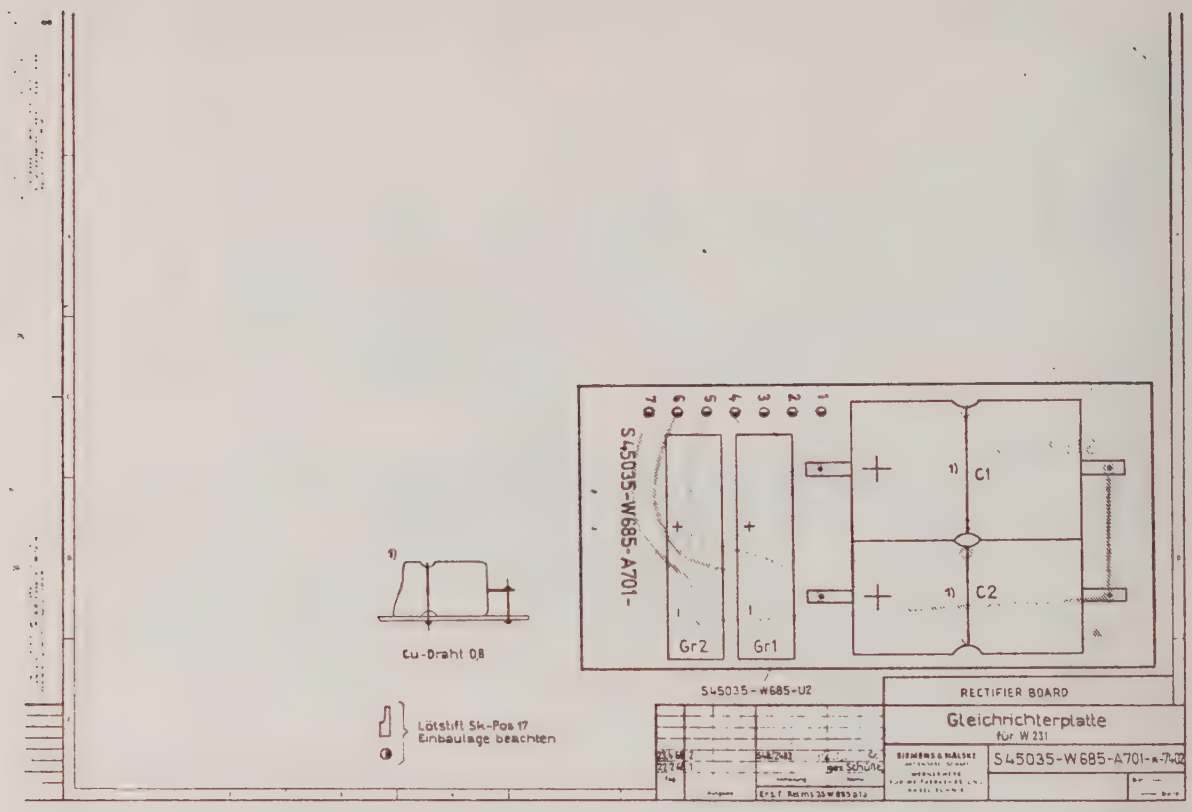
Herstellungszeichen
3 DIN 4451 schwarz
an beliebiger Stelle

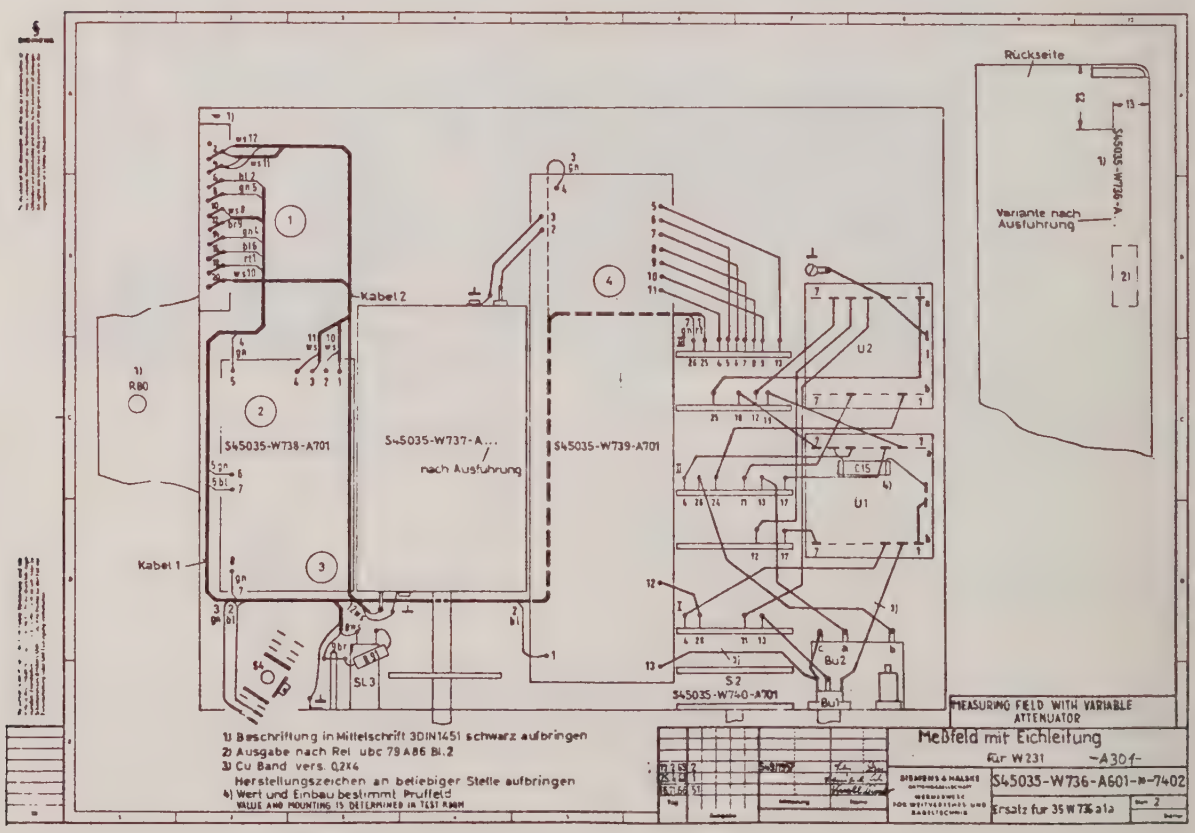
PRINTED-CIRCUIT BOARD II

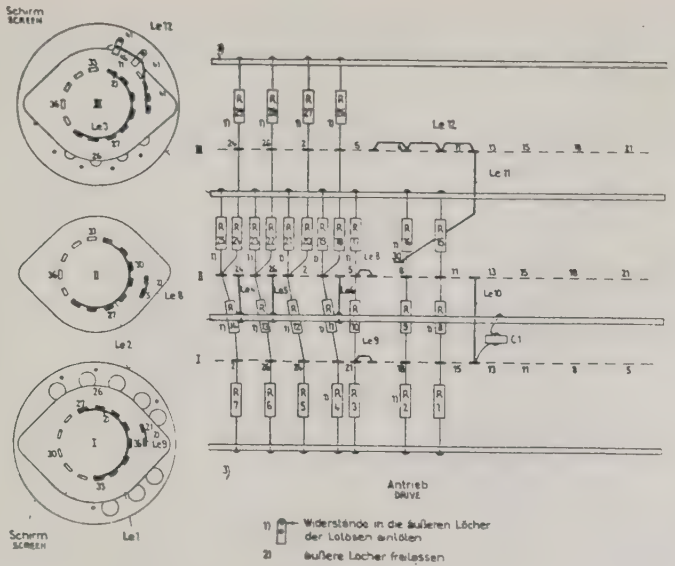
Verdrahtungsleiterplatte II

für W 231

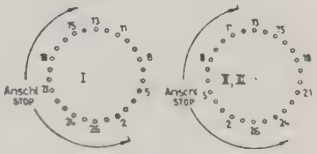
S45035-W684-A701-B-7692


S45035-W685-A701-
1)
C1
C2
Gr2
Gr1
Cu-Draht 0,8
Lötstift SK-Pos 17
Einbaulage beachten
S45035-W685-U2
RECTIFIER BOARD
Gleichrichterplatte
für W 231
SIEMENS & HALSKE
S45035-W685-A701-


Rückseite
S45035-W736-A...
Variante nach Ausführung
Kabel 2
Kabel 1
S45035-W738-A701
S45035-W737-A...
nach Ausführung
S45035-W739-A701
S45035-W740-A701
U2
U1
C15
Bu2
Bu1
S2
SL3
R80
1) Beschriftung in Mittelschrift 3DIN1451 schwarz aufbringen
2) Ausgabe nach Rel ubc 79 A86 Bl.2
3) Cu Band vers. 0,2x4
Herstellungszeichen an beliebiger Stelle aufbringen
4) Wert und Einbau bestimmt Prüffeld
VALUE AND MOUNTING IS DETERMINED IN TEST ROOM
MEASURING FIELD WITH VARIABLE ATTENUATOR
Meßfeld mit Eichleitung
für W 231 -A301-
SIEMENS & HALSKE
S45035-W736-A601-
Ersatz für 35 W 736 a1a



Bauteil	Anschlußenden konstr. ausgeformt nach	Bem.
R1,4,5,6,7,15,26 R27,28,29	C44249-A8-C326-0-27	in Sk. enthalten
R2,3	C44249-A8-C327-0-27	
R9	C44249-A8-C328	
R10	C44315-A12-C118-0-27	
R8,11,12	C44249-A8-C329-0-27	
R13,14	C44249-A8-C330-0-27	
R16,17	C44249-A8-C331-0-27	
R18	C44315-A12-C119-0-27	
R20,22,24	C44315-A12-C120-0-27	
R19,21,23,25	C44315-A12-C121-0-27	

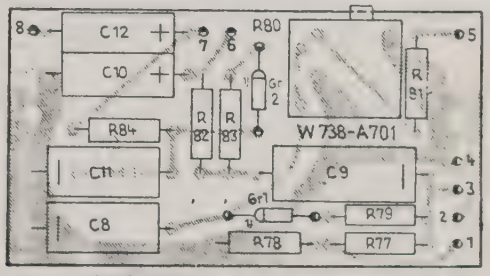


1) Widerstände in die äußeren Löcher der Lötösen einlöten
2) äußere Löcher freilassen
3) nach Einzelheit bei „E" in C44315-A12-A26 einlöten
4) Kontakte abschneiden

VARIABLE ATTENUATOR

Eichleitung
für W 231

SIEMENS & HALSKE | S45035-W737-A101-21-W-7402



S45035-W738-U1

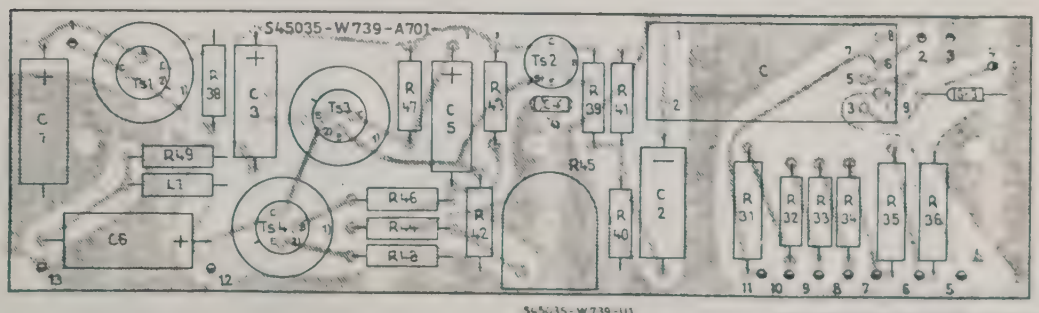
1) Prüffeldabgleich
TEST ROOM ALIGNMENT

Lötstift Sk-Ufd Nr. 40 Einbaulage beachten

MEASURING CIRCUIT

Meßkreis
für W 231

SIEMENS & HALSKE | S45035-W738-A701-W-7402



S45035-W739-U1

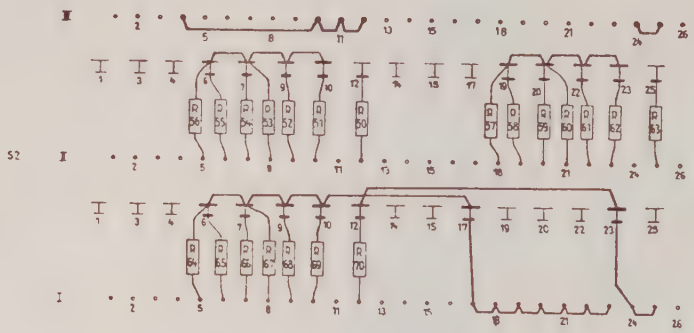
1) Sk-Ufd Nr. 59
2) Sk-Ufd Nr. 58
3) Sk-Ufd Nr. 69
5) Sk-Ufd Nr. 62

Lötstift Sk-Ufd Nr. 67 Einbaulage beachten

IMPEDANCE CONVERTER

Impedanzwandler
für W 231

SIEMENS & HALSKE | S45035-W739-A701-W-7402



1) Beschriftung im Mittelschrift 3 DIN 145 schwarz aufbringen
2) Ausgabe nach Rel ubc 79 A 86 Bl 2 Herstellungszeichen an beliebiger Stelle aufbringen

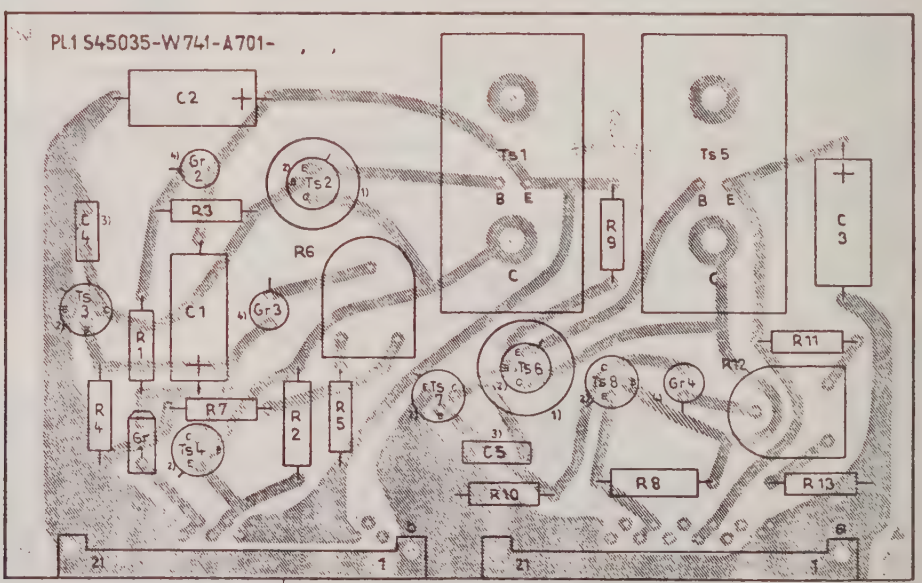
Widerstände ganz an der Schalterebene so kurz wie möglich einloten

IMPEDANCE SWITCH S2

Z-Schalter S2
für W 231

SIEMENS & HALSKE AKTIENGESELLSCHAFT WERNERWERK FÜR WEITVERKEHRS- UND KABELTECHNIK

S45035-W740-A701-[illegible]-7402



S45035-W741-U1

1) Sk.-lfd. Nr. 58
2) Sk.-lfd. Nr. 59
3) Anschlußenden mit Gewebe-Isolierschlauch (ca. 5mm) überziehen
4 Sk.-lfd Nr 42

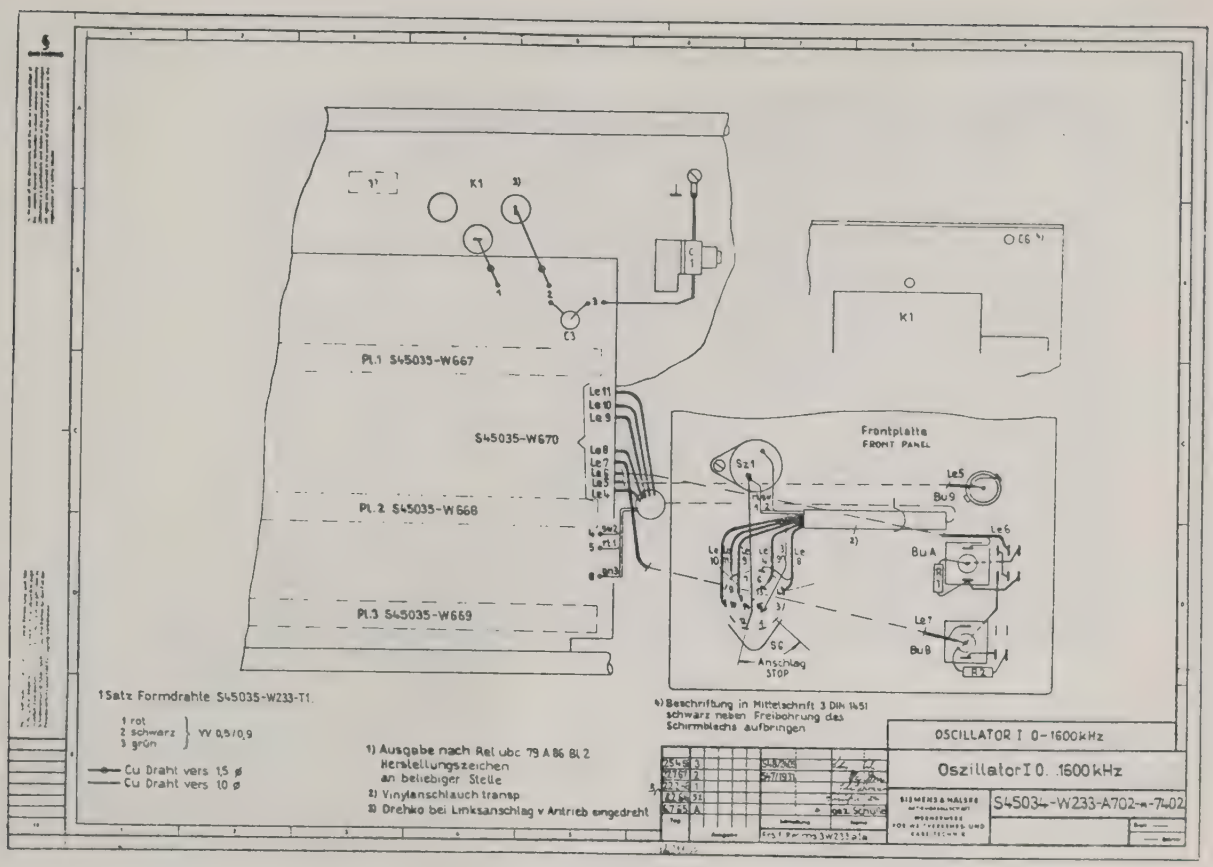
POWER SUPPLY UNIT II
BOARD1

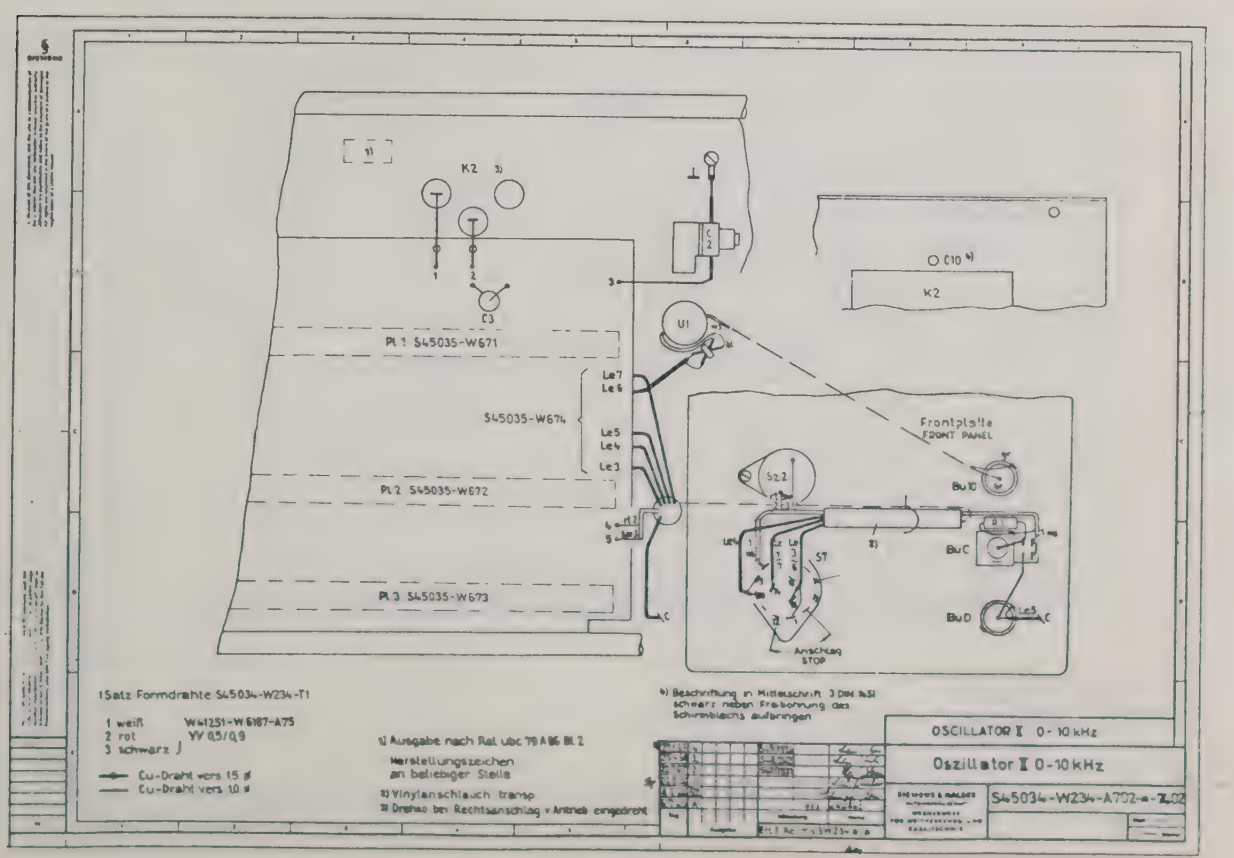
PL1 Netzteil II
für W231

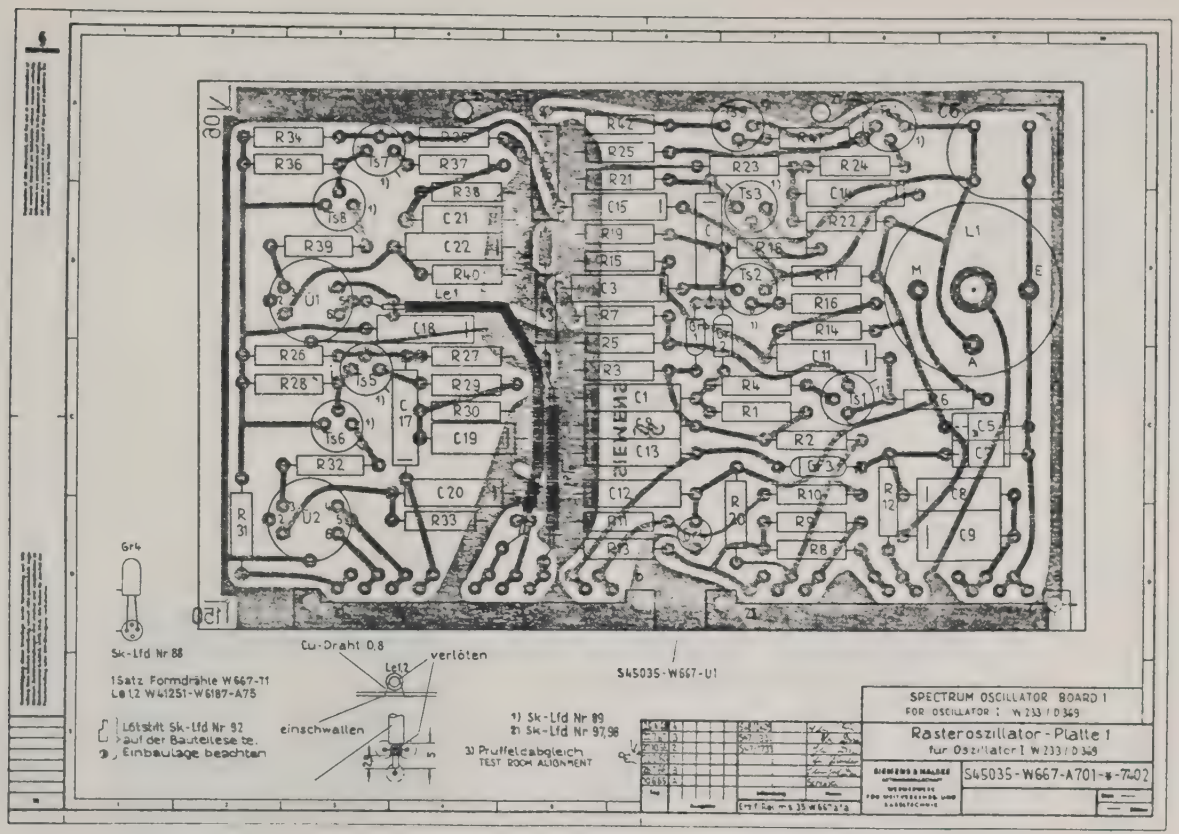
SIEMENS & HALSKE AKTIENGESELLSCHAFT WERNERWERK FÜR WEITVERKEHRS- UND KABELTECHNIK

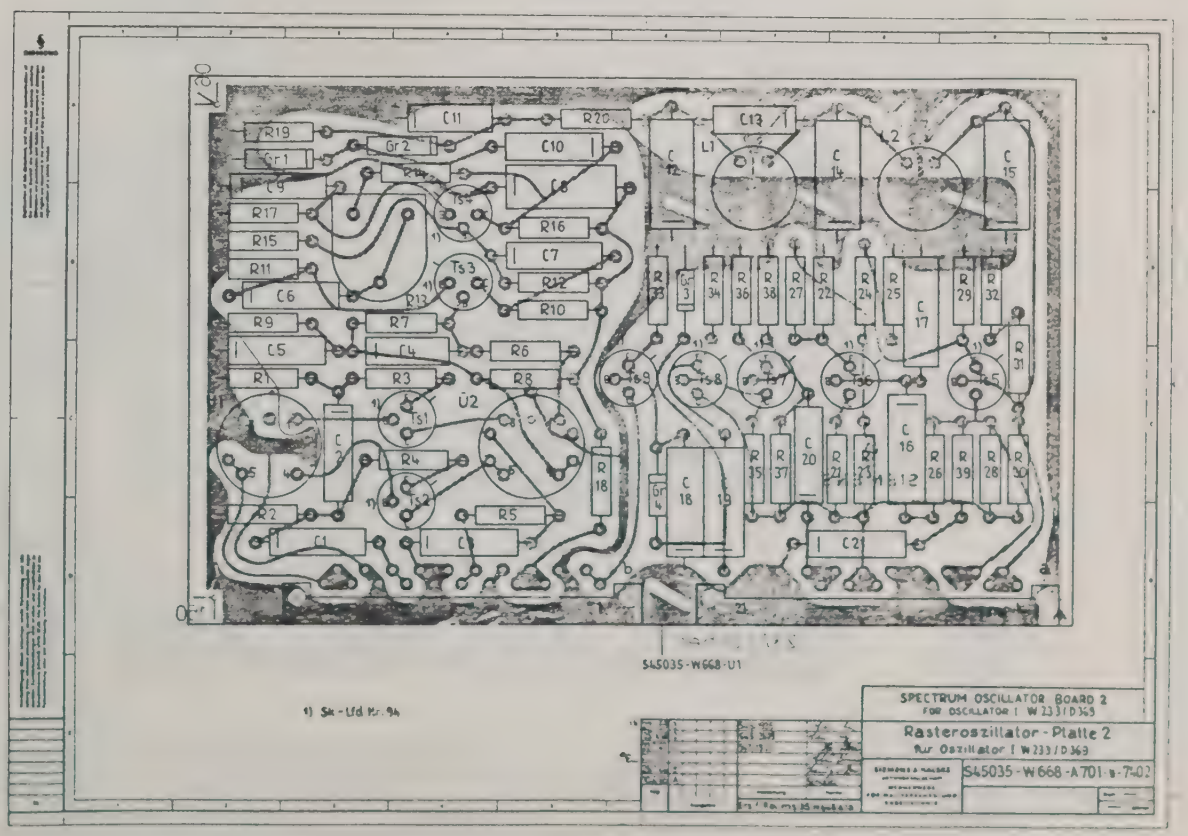
S45035-W741-A701-[illegible]-7402

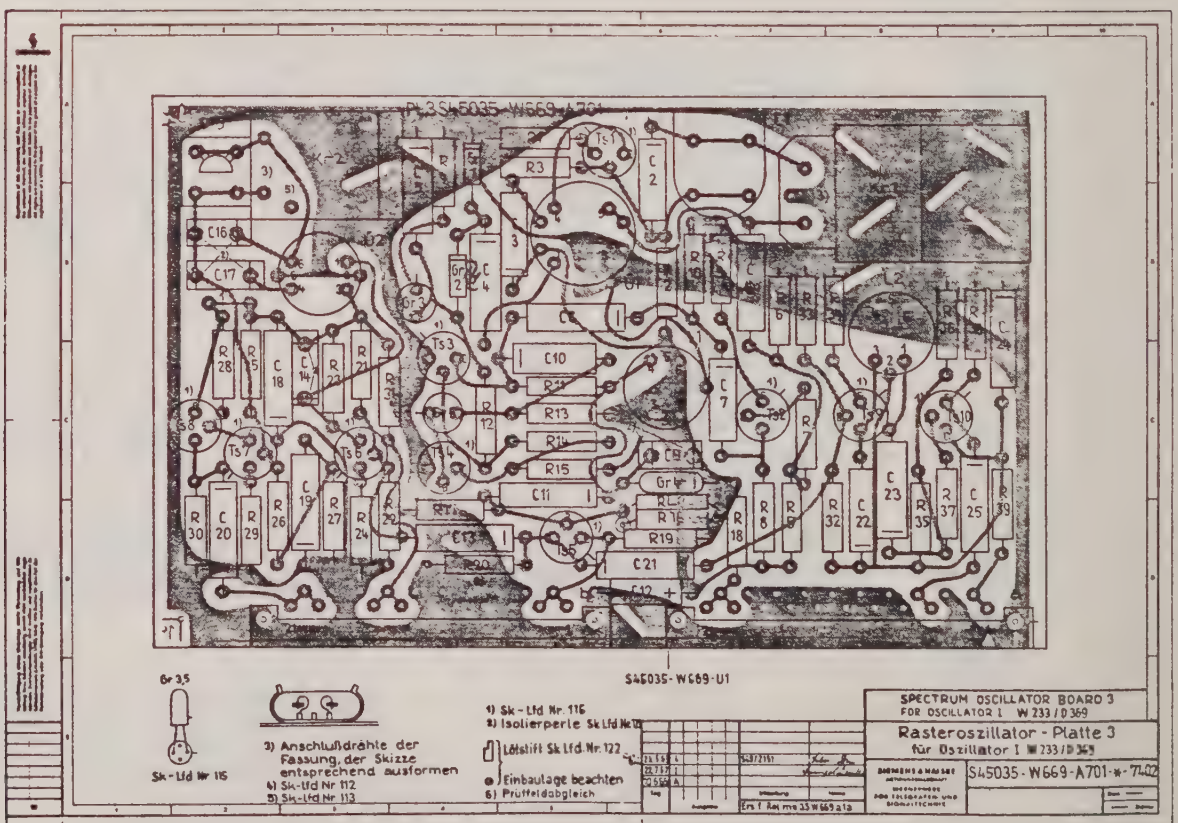
Ersatz Rel mns 35 W 741 a1a

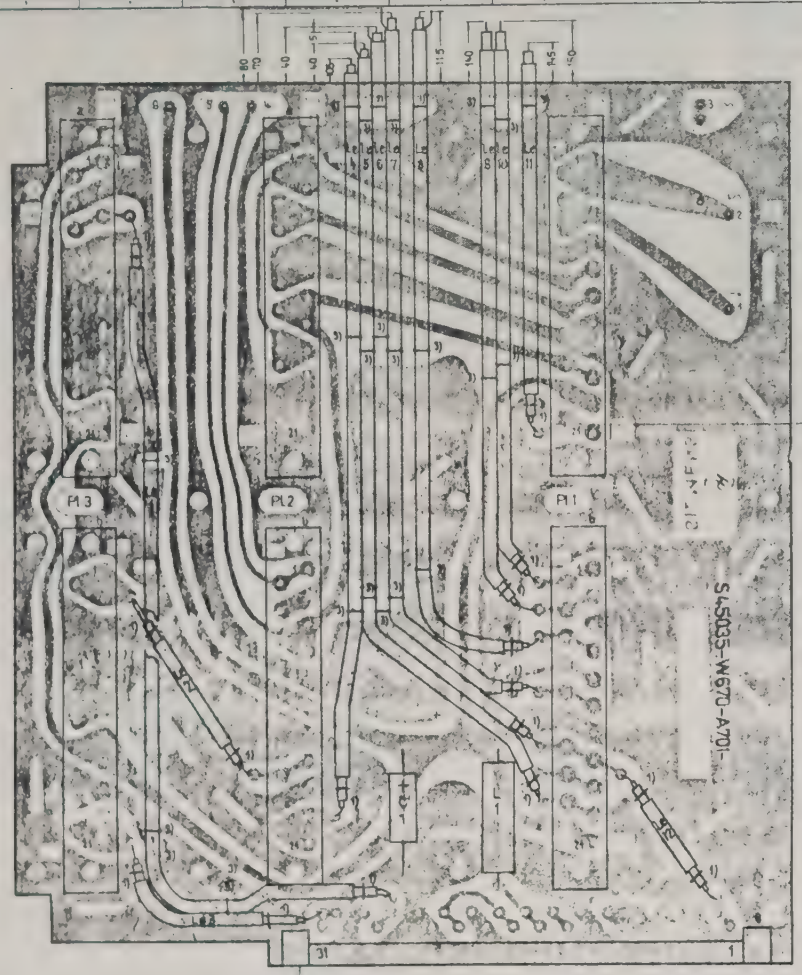

K1
C3
C1
Pl.1 S45035-W667
S45035-W670
Pl.2 S45035-W668
Pl.3 S45035-W669
C6
K1
Frontplatte
FRONT PANEL
Sz1
Le5
Bu9
Le6
Bu A
Le7
Bu8
S6
Anschlag
STOP
1 Satz Formdrahte S45035-W233-T1
1 rot
2 schwarz
3 grün
YV 0,5/0,9
Cu Draht vers 1,5 ø
Cu Draht vers 1,0 ø
1) Ausgabe nach Rel ubc 79 A 86 BL 2
Herstellungszeichen
an beliebiger Stelle
2) Vinylanschlauch transp
3) Drehko bei Linksanschlag v Antrieb eingedreht
4) Beschriftung in Mittelachsrichtung 3 DIN 1451
schwarz neben Freibohrung des
Schirmblechs aufbringen
OSCILLATOR I 0-1600kHz
Oszillator I 0...1600 kHz
SIEMENS & HALSKE
S45034-W233-A702-a-7402


K2
C3
C2
Pl.1 S45035-W671
S45035-W674
Pl.2 S45035-W672
Pl.3 S45035-W673
U1
C10
K2
Frontplatte
FRONT PANEL
Sz2
Bu10
BuC
BuD
S7
Anschlag
STOP
1 Satz Formdrahte S45034-W234-T1
1 weiß W41251-W6187-A75
2 rot YV 0,5/0,9
3 schwarz
Cu-Draht vers 1,5 ø
Cu-Draht vers 1,0 ø
1) Ausgabe nach Rel ubc 79 A 86 BL 2
Herstellungszeichen
an beliebiger Stelle
2) Vinylanschlauch transp
3) Drehko bei Rechtsanschlag v Antrieb eingedreht
4) Beschriftung in Mittelachsrichtung 3 DIN 1451
schwarz neben Freibohrung des
Schirmblechs aufbringen
OSCILLATOR I 0-10 kHz
Oszillator I 0-10 kHz
S45034-W234-A702-a-7402


SIEMENS
Gr4
Sk-Lfd Nr 88
1 Satz Formdrähte W667-T1
L1 L2 W412S1-W6187-A75
Cu-Draht 0.8
verlöten
einschwallen
S45035-W667-U1
1) Sk-Lfd Nr 89
2) Sk-Lfd Nr 97,98
3) Pruffeldabgleich
TEST ROOM ALIGNMENT
SPECTRUM OSCILLATOR BOARD 1
FOR OSCILLATOR I W 233/D 369
Rasteroszillator - Platte 1
für Oszillator I W 233/D 369
S45035-W667-A701-B-7402


S45035-W668-U1
1) Sk-Lfd Nr 94
SPECTRUM OSCILLATOR BOARD 2
FOR OSCILLATOR I W 233/D 369
Rasteroszillator - Platte 2
für Oszillator I W 233/D 369
S45035-W668-A701-B-7402


PL 3 S45035-W669-A701
S45035-W669-U1
Gr 3,5
Sk-Lfd Nr 115
3) Anschlußdrähte der Fassung, der Skizze entsprechend ausformen
4) Sk-Lfd Nr 112
5) Sk-Lfd Nr 113
1) Sk-Lfd Nr. 116
2) Isolierperle Sk Lfd Nr 13
Lötstift Sk Lfd. Nr. 122
Einbaulage beachten
6) Prüffeldabgleich
SPECTRUM OSCILLATOR BOARD 3
FOR OSCILLATOR 1 W 233/D 369
Rasteroszillator - Platte 3
für Oszillator 1 W 233/D 369
S45035-W669-A701-*-7402
Ers f. An ms 35 W 669 a 13

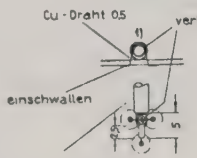


C44326 - A14 - B28 beachten

Lötstift Sk -LfdNr18 auf der Leiterseite
Einbaulage beachten

Ausgabe von Sk str.ms

1 Satz Formdrähte S45035-W670-T1.
Lef. Le 12 W41251-W6187-A75



freie Leitungsenden der Le14-11
mit Schrumpfschlauch überziehen

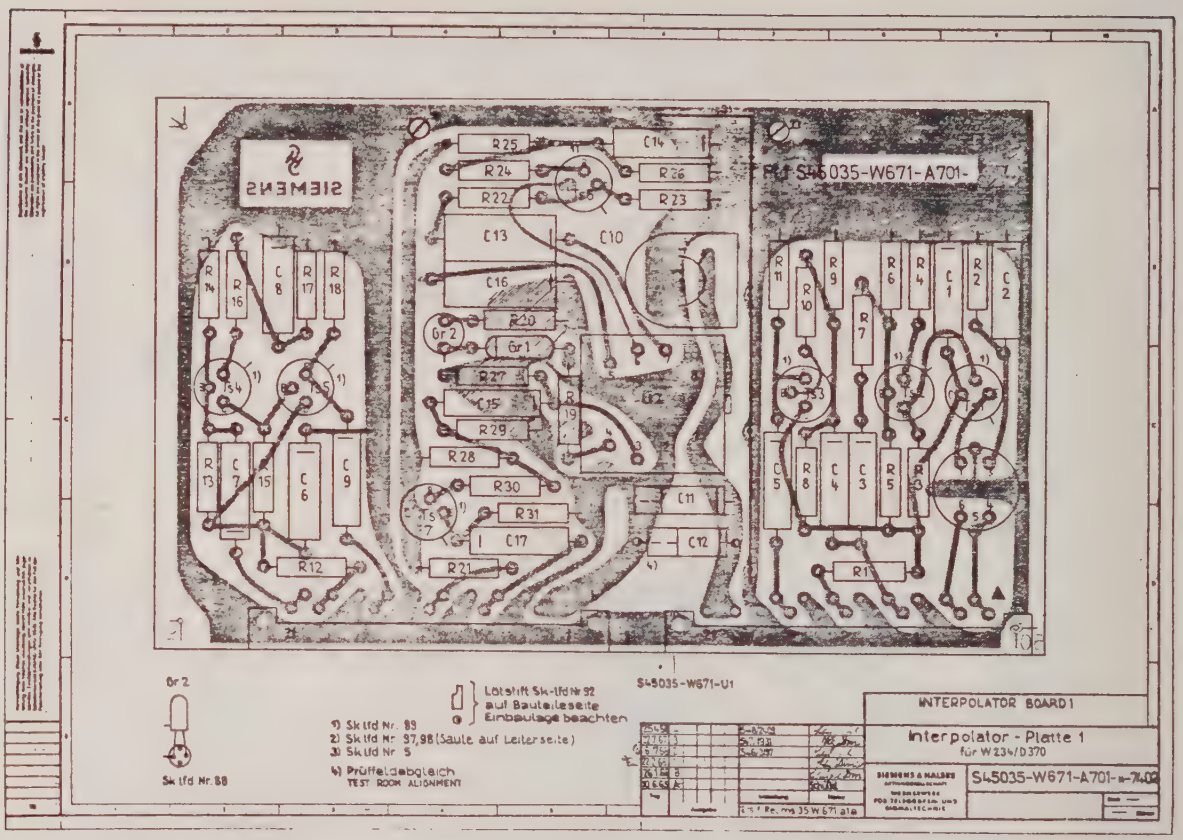
2) Beschriftung in Mittelschrift 3 DIN 1451
schwarz aufbringen
Herstellungszeichen an beliebiger Stelle

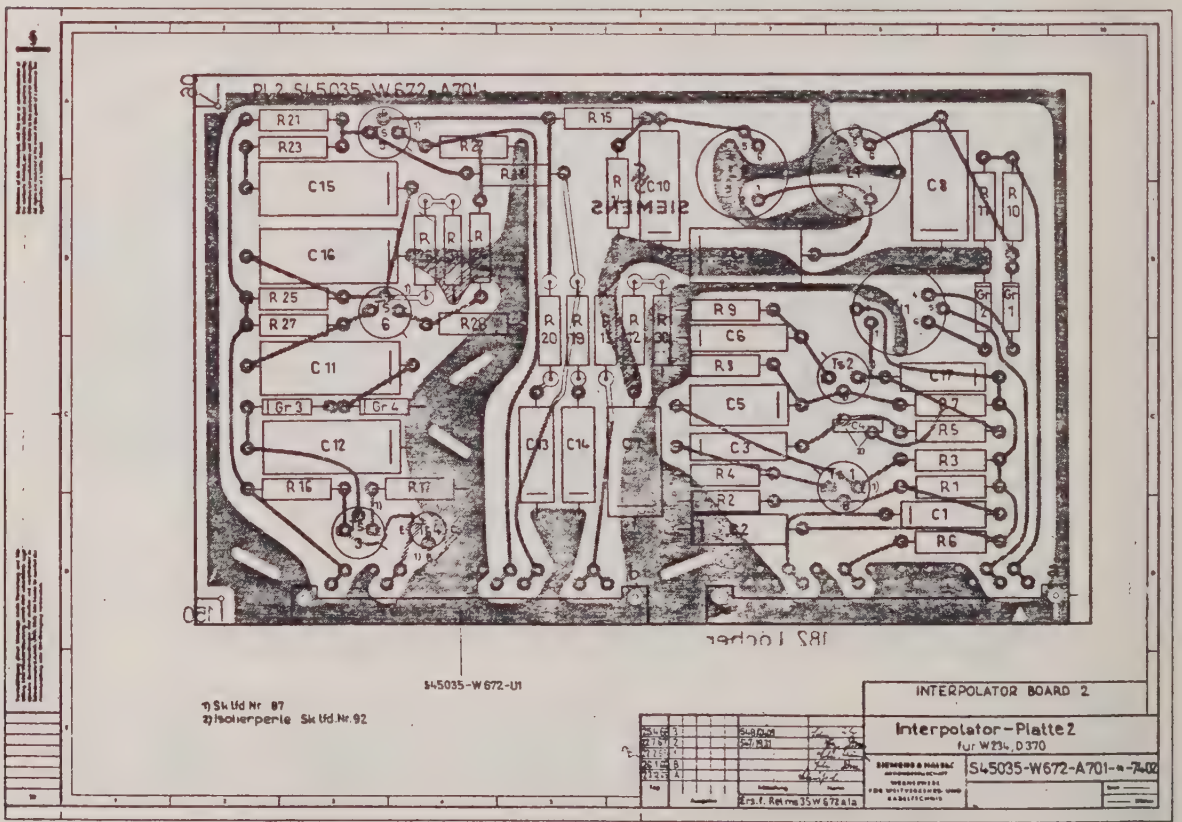
PRINTED CIRCUIT BOARD
FOR OSCILLATOR I W 233/ D 369

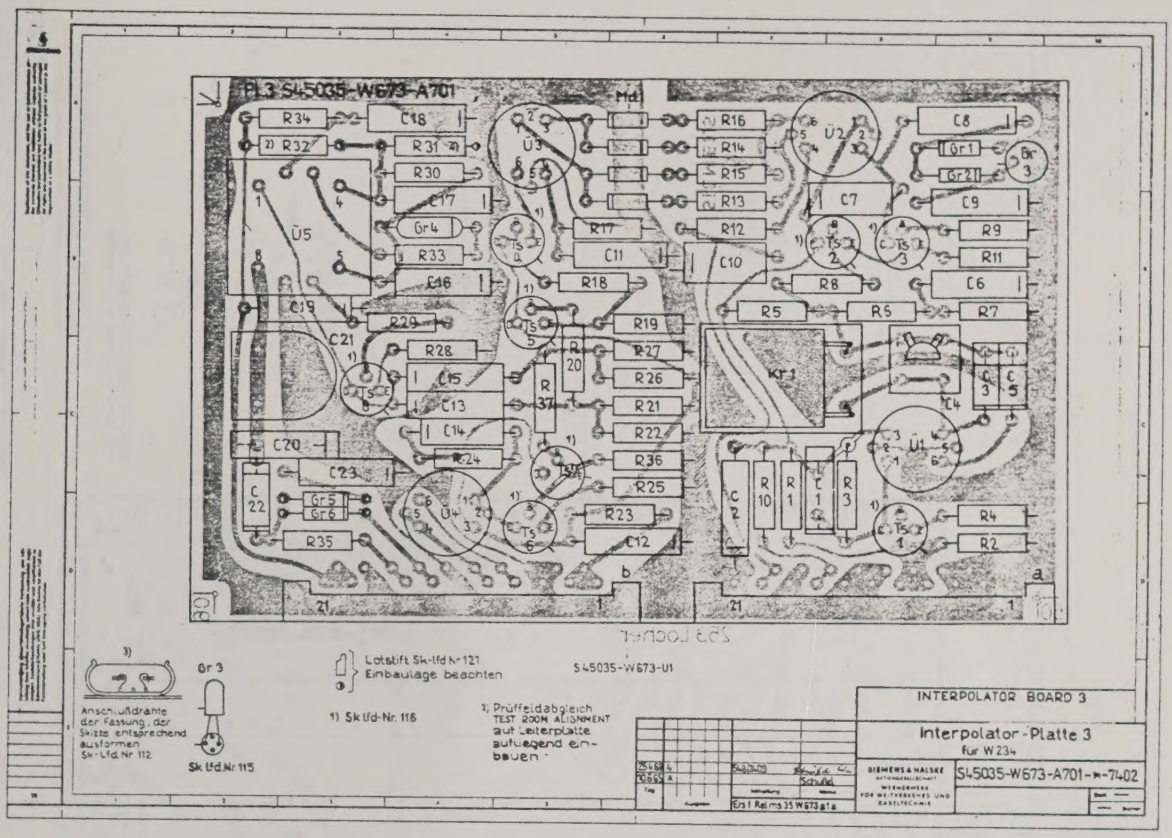
Verdrahtungsleiterplatte
für Oszillator I W 233/ D369

SIEMENS & HALSKE

S45035-W670-A701-w-7402


SIEMENS
Pl.1 S45035-W671-A701-
R25
R24
R22
C14
R26
R23
C13
C10
C16
R20
Gr2
Gr1
R27
C15
R29
R28
R30
R31
C17
C11
C12
R21
R12
R14
R16
C8
R17
R18
C7
C6
C9
R13
R11
R10
R9
R7
R6
R4
C1
R2
C2
C5
R8
C4
C3
R5
R3
R1
Gr 2
Sk Ltd Nr 88
Lötstift Sk-Ltd-Nr 92 auf Bauteileseite Einbaulage beachten
1) Sk Ltd Nr. 89
2) Sk Ltd Nr 97,98 (Saute auf Leiterseite)
3) Sk Ltd Nr 5
4) Prüffeldabgleich
TEST ROOM ALIGNMENT
S45035-W671-U1
INTERPOLATOR BOARD1
Interpolator - Platte 1
für W234/D370
S45035-W671-A701-a-7402


Pl.2 S45035-W672-A701-
R21
R23
C15
C16
R25
R27
C11
Gr3
Gr4
C12
R16
R17
R15
R22
R24
C10
SIEMENS
R20
R19
R32
R30
C13
C14
R9
C6
R8
C5
C3
R4
R2
R12
C8
R11
R10
Gr2
Gr1
C7
R7
R5
R3
R1
C1
R6
S45035-W672-U1
1) Sk Ltd Nr 87
2) Isolierperle Sk Ltd.Nr.92
INTERPOLATOR BOARD 2
Interpolator-Platte 2
für W234, D370
S45035-W672-A701-a-7402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R31
R30
C17
Gr4
R33
C16
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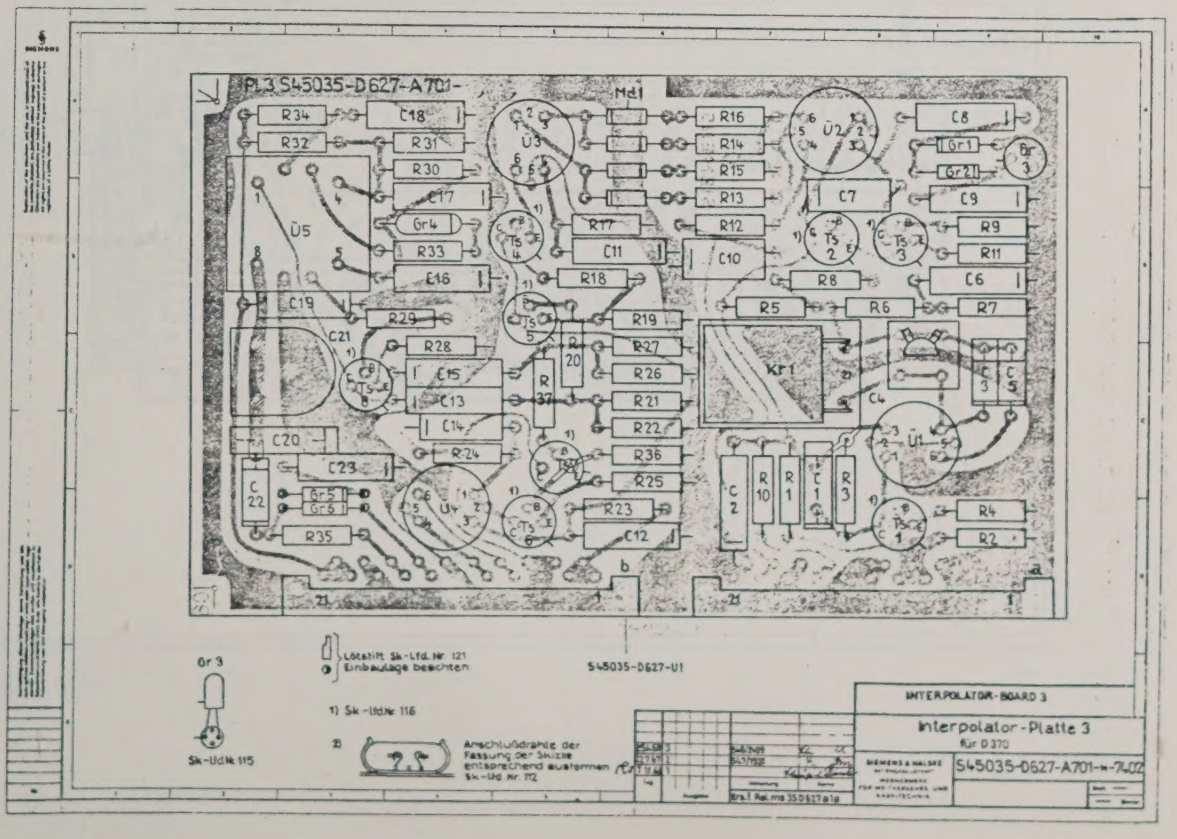
R29
C21
R28
C15
C13
C14
R24
C20
C23
C22
Gr5
Gr6
R35
U5
U3
U4
U2
U1
Kr1
R16
R14
R15
R13
R17
R12
C11
C10
R18
R8
R5
R19
R27
R26
R21
R22
R36
R25
R23
C12
R20
R37
C8
Gr1
Gr2
Gr3
C7
C9
R9
R11
C6
R7
C4
C3
C5
C2
R10
R1
C1
R3
R4
R2
TS 1
TS 2
TS 3
TS 4
TS 5
TS 6
a
b
21
1
Lotstift Sk-lfd Nr 121
Einbaulage beachten
S45035-W673-U1
Gr 3
Sk lfd.Nr 115
1) Sk lfd-Nr 116
2) Prüffeldabgleich
TEST ROOM ALIGNMENT
auf Leiterplatte
aufliegend einbauen
Anschlußdrähte der Fassung, der Skizze entsprechend ausformen
Sk-Lfd. Nr 112
INTERPOLATOR BOARD 3
Interpolator-Platte 3
für W 234
SIEMENS & HALSKE
S45035-W673-A701-*-7402
Ers f Rel ms 35 W673 a1a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Gr4
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C15
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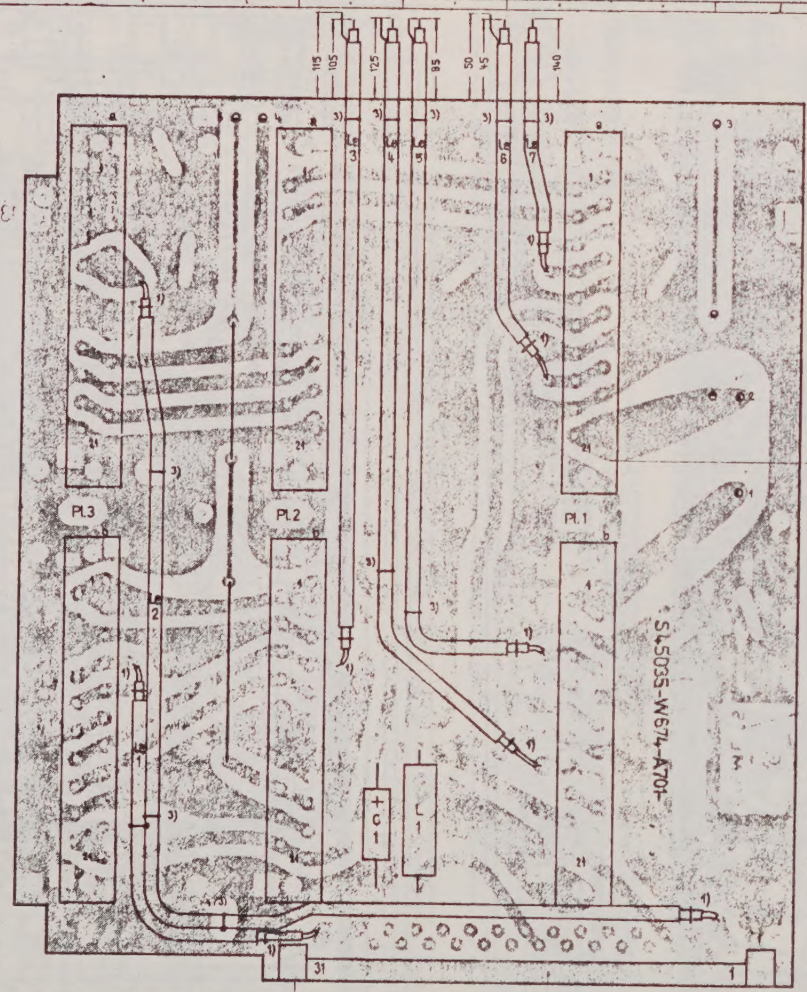
C14
R24
C20
C23
C22
Gr5
Gr6
R35
U5
U3
U4
U2
U1
Kr1
R16
R14
R15
R13
R17
R12
C11
C10
R18
R8
R5
R6
R19
R27
R26
R21
R22
R36
R25
R23
C12
R20
R37
C8
Gr1
Gr2
Gr3
C7
C9
R9
R11
C6
R7
C4
C3
C5
C2
R10
R1
C1
R3
R4
R2
TS 1
TS 2
TS 3
TS 4
TS 5
TS 6
a
b
21
1
Lotstift Sk-Lfd. Nr. 121
Einbaulage beachten
S45035-D627-U1
Gr 3
Sk-Lfd.Nr. 115
1) Sk-Lfd.Nr 116
2)
Anschlußdrähte der Fassung der Skizze entsprechend ausformen
Sk-Lfd. Nr. 112
INTERPOLATOR-BOARD 3
Interpolator-Platte 3
für D 370
SIEMENS & HALSKE
S45035-D627-A701-*-7402
Ers f Rel ms 35 D627 a1a

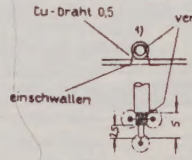


C44326 - A14 - B28 beachten

Lötstift Sk-Ltd.Nr.18 auf der Leiterseite
Einbaulage beachten

Ausgabe von Sk str.ms

1 Satz Formdrähte S45035-W674-T1:
Le1 . Le7 W41251-W6187-A75



freie Leitungsenden der Le3-Le7
mit Schrumpfschlauch überziehen

1) Beschriftung in Mittelschrift 3 DIN 1451
schwarz aufbringen
Herstellungszeichen an beliebiger Stelle

PRINTED CIRCUIT BOARD
FOR OSCILLATOR II W234/ D370

Verdrahtungsleiterplatte
für Oszillator II W234/ D370

SIEMENS & HALSKE

S45035-W674-A701-W-7402

Ers f Rel 35 W674 a1a